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# USSR Report

CHEMISTRY

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CHEMISTRY

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### STUDY OF STRUCTURE AND CAPILLARY PROPERTIES OF CARBON MATERIALS, INFLUENCE OF VARIOUS COAL-PRODUCING TECHNIQUES

Moscow ELEKTROKHIMIYA in Russian Vol 21, No 9, 1985 (manuscript received 2 Aug 1984) pp 1252-1255

DRIBINSKIY, A.V., SHETYNBERG, G.V. and KUKUSHKINA, I.A.

[Abstract] The influence of various processing techniques on the structure and capillary properties of small coal pores was investigated. KM-2 active coal with a large pore volume was decalcified and heated in a hydrogen atmosphere. The specimens were then heated in  $\text{NH}_3$ ,  $\text{Cl}_2$ , air,  $\text{CO}_2$ , and He atmospheres purified of nitrogen oxide, anodized in an alkaline solution, rinsed, and dried. The adsorption isotherms of benzene vapors and steam at  $20^\circ\text{C}$  were measured and compared. The volume of the basic types of pores, the surface of the mesopores, and the parameters of the microporous structure of the coal specimens was calculated. Decalcification caused a noticeable decrease in filled density, a sharp drop in ash content, and some growth in the cumulative pore volume. Decalcification also increased the coal's hydrophilicity and led to a sharp increase in the number of acids and a decrease in the number of basic oxides. High-temperature heating of coal specimens in a hydrogen atmosphere resulted in a small increase in the observed mesopore volume, a sharp drop in the number of acidic oxides, and an increase in the number of basic oxides. The various processing techniques involving gases and anodization did not cause observable changes in the micro- and mesoporous structures nor a noticeable reduction in the number of basic groups. The most significant changes were observed during anodization and processing with chlorine and atmospheric oxygen. The change in the coal's hydrophilicity is associated with changes in the surface properties of the coal, as the structural characteristics were essentially unaffected. Figures 4; references 14: 10 Russian, 4 Western.  
[101-13050/12379]

## CONCENTRATION OF GOLD AND SILVER BY CHELATING ADSORBENT POLYORGS XI-N

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 40, No 9, 1985 (manuscript received 21 Nov 84) pp 1606-1610

SHEVOYEVA, O.P., KUCHAVA, G.P., MYASOYEDOVA, G.V., SAVVIN, S.B., BANNYKH, L.N., ZHUKOVA, N.G., GRISHINA, O.N. and MEZHIROV, M.S., Institute of Geochemistry and Analytical Chemistry imeni V.I. Vernadskiy, USSR Academy of Sciences, Moscow; All-Union Scientific Research Institute of Synthetic Fibers, Kalinin

[Abstract] Trials were conducted with the use of POLYORGS XI-N chelating adsorbent for the concentration of Au and Ag from NaCl solutions. POLYORGS XI-N is an acid- and alkali-stable fibrous material produced from polyacrylonitrile, filled with a chelating agent consisting of 50 wt% of heterocyclic amine groups. In both filter (static) and flow-through set-ups 98-99% recovery of Au and Ag was obtained under the proper conditions. Optimum pH range of Au adsorption was 1-7, and for Ag ca. pH 4-9+. In the case of Ag and Au mixtures, the optimal pH range was 5-7. In the case of both Au and Ag 99% elution from POLYORGS XI-N was obtained with 0.1 M thiourea in 0.1 M HCl. The method appears to be a promising technique for the extraction and concentration of Au and Ag from both industrial waste waters as well as natural waters. Figures 5; references 8. 7 Russian (1 in English), 1 Western. [113-12172/12379]



## AEROSOLS

UDC 65.011.56:621.798-986.002.2

### AUTOMATED ROTARY CONVEYER ASSEMBLY LINE IN AEROSOL CONTAINER PRODUCTION

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 9, 1985 pp 568-569

ELMANOVICH, V.V., YUDIN, A.M. and OZOLIN, K.G.

[Abstract] In view of the growing improvements of aerosol products in the USSR designed for household use, a rotary, fully automated, conveyor assembly has been designed, tested, and designated LSKA-1000. The assembly is designed for the production of the valve component, and has a production figure of 1000 units per minute, which is one of the highest in the world for this type of assembly. The decisions of the CC of the CPSU and of the USSR Council of Ministers to adopt LSKA-1000 in the Soviet industry will assure further development and expansion of the aerosol container industry in the USSR. References 5 (Russian).

[133-12172/12379]

## ALKALOIDS IN VINCA MAJOR L.

Dushanbe DOKLADY AKADEMII NAUK TADZHIKSKOY SSR in Russian Vol 28, No 5, 1985  
(manuscript received 6 Feb 1985) pp 289-292

SADYKOV, Yu.D., KHODZHIMATOV, M. and DEPTYAREV, V.A., Institute of Chemistry  
imeni V.I. Nikitin, TaSSR Academy of Sciences

[Abstract] The alkaloid content of Vinca major L. during its blooming stage was investigated. Ten kg of above-ground plant material was processed in a 10-percent aqueous solution of  $\text{NH}_4\text{OH}$  and subjected to exhaustive ether extraction. The alkaloids were separated from the ether extract using 10-percent sulfuric acid. This solution was alkalinized with a 20-percent solution of  $\text{NH}_4\text{OH}$  and extracted with ether. Seventy grams of alkaloids were obtained, and dissolved in 1.62 liters of benzene and fractionated with a citrate-phosphate buffer solution. Six fractions were separated with aluminum oxide, and the alkaloids were eluted with ether, methanol, ethanol, benzene, a mixture of benzene and ether, chloroform, a mixture of chloroform and methanol, and acetone. Chromatography was used to separate reserpine  $\text{C}_{22}\text{H}_{26}\text{N}_2\text{O}_4$ . The master batch was then acidified with hydrochloric acid and extracted with ether to obtain maydin [transliteration]  $\text{C}_{23}\text{H}_{28}\text{N}_2\text{O}_6$ . Elution of the fourth fraction with methanol yielded vinkamayin [transliteration]  $\text{C}_{22}\text{H}_{26}\text{N}_2\text{O}_3$ . Chromatography of the fifth fraction yielded a base which, after recrystallization from acetone, yielded akuamin [transliteration]  $\text{C}_{22}\text{H}_{26}\text{N}_2\text{O}_4$ . The sixth fraction was eluted with benzene to obtain vomicine  $\text{C}_{22}\text{H}_{24}\text{N}_2\text{O}_4$ . Of the total alkaloid content, reserpine accounted for 30.31%, maydin for 24.85%, vinkamayin for 20.27%, akuamin for 12.14%, and vomicine for 10.32%. Most of the alkaloids were found in the leaves and stems. A number of reserpine salts were also derived. References 5 (Russian).  
[104-13050/12379]

## ANALYTICAL CHEMISTRY

NORTHWESTERN DEPARTMENT OF USSR ACADEMY OF SCIENCES SCIENTIFIC COUNCIL FOR ANALYTICAL CHEMISTRY

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR: SERIYA KHIMICHESKAYA in Russian No 4, 1985 pp 503-504

[Article by A. Sturis]

[Excerpts] The sixth regular joint meeting of the section for analysis of environmental objects and the section for analytical chemistry of the Latvian board of the All-Union Chemical Society imeni D. I. Mendeleyev was held 18 December 1984 in the city of Olayne at the Biolar Scientific-Production Association.

The meeting was devoted to examining the urgent problems of pollution and analysis of natural objects, and particularly to the results of work carried out at the Biolar Scientific-Production Association pertaining to environmental conservation.

In his report, Latvian Agricultural Academy Docent I. P. Streypa described the basic problems of contamination of soil in the Latvian SSR by intensive farming. Soil contamination may be treated as an influence which disturbs exchange processes and puts a halt to self-purification; as excessive enrichment of soil by substances that are useful as a way of obtaining maximum yield weight but which are harmful to the quality of the resulting agricultural products; as enrichment of soil by compounds toxic to plants and animals.

Candidate of Chemical Sciences M. V. Virtsavs presented the principles of a method of concentrating heavy toxic metals in natural waters by coprecipitation with 8,8'-diquinolyl disulfide. The method was developed in the Institute of Inorganic Chemistry of the Latvian SSR Academy of Sciences, and it has enjoyed wide application in the USSR as a means of concentrating heavy metals for analysis of river, lake, sea and ocean water, atmospheric precipitation and natural waters of volcanic origin in permanent laboratories and in the field.

In his report, M. N. S. [not further identified] Yu. R. Laurs described methods developed at the Biolar Scientific-Production Association for determining nitrogen-containing organic substances in the air of a work

zone. Methods developed in cooperation with the Department of Analytical Chemistry of the Belorussian State University imeni V. I. Lenin and the Kuybyshev Medical Institute have enjoyed wide practical application.

A report on the results of work done at the Biolar Scientific-Production Association on nature conservation was given by Candidate of Chemical Sciences A. V. Basilevich, director of the sector for nature conservation and anticorrosion protection of the Biolar Scientific-Production Association. The sector is working in five directions: industrial toxicology, determination of the fire and explosion hazards of substances, selection of corrosion-resistant materials, development of the norms for maximum permissible discharges, and development of methods for determining the concentrations of different substances in the air of a work zone. In 4 years, the toxicological characteristics and the fire and explosion hazards of 250 substances were established and 22 procedures for determining the concentrations of different substances in the air of a work zone were developed through the efforts of the sector's associates and various other institutions. A procedure that was developed for determining metal stearates has great significance because the latter are released by several plants on a large scale.

Kaliningrad University Docent G. A. Rybakova gave information on work done by the environmental protection department, by the department of inorganic chemistry and by the atmospheric air analysis laboratory of Kaliningrad University. Existing methods for determining toxic impurities in industrial exhausts, in which over 30 ingredients can be determined, were developed, and existing methods were improved. Industrial exhausts from three principal industrial enterprises in the city center have been subjected to analysis for a number of years.

Measures in the area of analyzing natural objects in the Estonian SSR were reported by Candidate of Technical Sciences E. Ya. Maremyae. Research was conducted on the contaminating influence of spontaneous combustion of shale on the natural environment. Instrumental multielement neutron-activation analysis, spectrum analysis and various chemical methods of analysis were widely used to analyze natural objects in the Estonian SSR. Much work was done to determine the background concentration of heavy metals in biological objects and in the surface layer of marshes.

The status of a number of urgent problems concerned with analyzing contamination of the natural environment and its protection were examined in detail in the reports and statements. It was noted in this connection at the meeting that the great diversity of organic and inorganic contaminants makes it necessary to develop new, more sensitive, accurate and selective methods of analyzing natural objects, because the existing methods cannot satisfy today's practical requirements in terms of accuracy, sensitivity and selectivity as well as in terms of the degree of their automation.

The following was noted in the adopted resolution.

With the objective of fulfilling the decrees of the CPSU Central Committee and Soviet government concerned with environmental protection, it was resolved

that it was necessary to widen research in the northwestern region with the purpose of creating new, more effective methods of analyzing natural objects, making wide use of chromatography, atomic absorption analysis, mass spectrometry, ionometry, multielement neutron-activation analysis and other modern methods of determining elements in natural waters, soils, atmosphere and agricultural products.

It was resolved to approve the work being carried out by the Biolar Scientific-Production Association in the area of environmental protection, and to recognize the promise held by the selected direction of work aimed at determining toxic substances in the air of a work zone.

It was resolved to recommend methods of air quality control developed by the association for wide introduction in laboratory practice; this pertains especially to the method of group determination of metal stearates.

With the purpose of reducing discharges of toxic substances into the environment, it was resolved to recommend, to the Biolar Scientific-Production Association, to widely develop scientific research associated with introducing low-waste or wasteless production processes.

It was resolved to recognize the need for developing research having the purpose of creating methods of quantitative determination of organic contaminants in natural objects.

It was resolved to recommend, to the management of the Biolar Scientific-Production Association, to create a single structural nature conservation subdivision in the association and exclude, from its activities, problems of safety and labor protection not within its area of expertise.

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# MASS SPECTROMETRIC ANALYSIS OF NONVOLATILE THERMALLY UNSTABLE SUBSTANCES INVOLVING ION EXTRACTION FROM SOLUTION UNDER ATMOSPHERIC PRESSURE

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 40, No 9, 1985 (manuscript received 18 Jun 84) pp 1570-1580

ALEKSANDROV, M.L., GALL, L.N., KRASNOV, N.V., NIKOLAYEV, V.I. and SHKUROV, V.A., Institute of Analytical Instrument Construction, USSR Academy of Sciences, Leningrad

[Abstract] Theoretical and experimental data are presented on mass spectrometry of nonvolatile organic and bioorganic compounds by means of ion extraction from solution under atmospheric pressure. This approach is based on ion formation in such solutions, which precludes the need for a special ionization step, and the extraction of such ions and their introduction into the mass spectrometer. Techniques employed in ion extraction from solution under atmospheric pressure have been previously described [Aleksandrov, M.L., et al., Dokl. AN SSSR, 277(2): 379, 1984]; they involve rapid evaporation into the gas phase of charged microdroplets of the solution under investigation. Subsequently, the extracted ions are formed into an ultrasonic gas stream consisting of cluster, monomolecular, and fragmented ions directed into the mass spectrometer. In practical terms, the system involves a coupling of a liquid microcolumn chromatograph with a mass spectrometer. This method has been applied to achieve high resolution analysis of solutions of inorganic salts and bioorganic compounds. Figures 8; references 41: 11 Russian, 50 Western.  
[113-12172/12379]

# CHEMILUMINESCENCE QUENCHING ANALYSIS BASED ON REACTION OF LUMINOL WITH $K_3Fe(CN)_6$ AND INORGANIC INHIBITORS

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 40, No 9, 1985 (manuscript received 9 Jul 84) pp 1581-1585

KALINICHENKO, I.Ye., TRACHUK, T.M. and PILIPENKO, A.T., Institute of Colloid Chemistry and Water Chemistry imeni A.V. Dumanskiy, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] An analysis was conducted of a variety of organic and inorganic compounds to determine their effects on chemiluminescence resulting from oxidation of luminol by  $K_3Fe(CN)_6$ , in order to devise sensitive fluorescence quenching assays. In borate buffer, pH 11.8, two-fold quenching was obtained with  $10^{-9}$  M  $OsO_4$ ,  $5 \times 10^{-9}$  M  $CuCl_2$ , and  $2 \times 10^{-8}$  M  $RuO_4$ , and with ca.  $10^{-6}$  M



KMnO<sub>4</sub>, KIO<sub>4</sub>, and AuCl<sub>3</sub>. These chemicals also quenched fluorescence obtained from the reaction of luminol with Cl<sub>2</sub>, Br<sub>2</sub>, I<sub>2</sub> and with K<sub>2</sub>S<sub>2</sub>O<sub>8</sub> in the presence of Ni(II). Fluorescence was not affected by ca. 10<sup>-5</sup> M or lower concentrations of KClO<sub>3</sub>, KBrO<sub>3</sub>, KIO<sub>3</sub>, Na<sub>2</sub>TeO<sub>4</sub>, NaNO<sub>2</sub>, KReO<sub>4</sub> or K<sub>2</sub>S<sub>2</sub>O<sub>8</sub>. In addition, Ag salts and H<sub>2</sub>O<sub>2</sub> enhanced fluorescence. Specific assays based on this method showed that for Cu(II), OsO<sub>4</sub>, H<sub>2</sub>O<sub>2</sub> and hydroquinone (in terms of H<sub>2</sub>O<sub>2</sub>) respective sensitivities of 1.5 x 10<sup>-10</sup> M, 10<sup>-10</sup> M, 1.5 x 10<sup>-10</sup> M and 2 x 10<sup>-9</sup> M can be expected. Figures 3; references 13:

11 Russian, 2 Western.

[113-12172/12379]

UDC 543.253:677.4

#### DETERMINATION OF LITHIUM IN ORGANIC SOLVENT-WATER SYSTEMS BY AC POLAROGRAPHY

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 40, No 9, 1985 (manuscript received 13 Sep 84) pp 1586-1590

YAKUSHINA, Ye.V. and PETROV, S.I., Moscow Textile Institute imeni A.N. Kosygin

[Abstract] AC polarography was employed in the determination of lithium ion in aprotic dipolar solvents to devise a reproducible analytical method to replace or complement complex and work-intensive techniques presently available. Comparative analyses of the signals were conducted for lithium in dimethyl acetamide, dimethylformamide, and dimethyl sulfoxide and their mixtures with water and without 0.1 M tetra-alkylammonium salts. Addition of water was seen to increase the amplitude of the polarographic signal and alter its form, depending on the organic solvent employed. A similar increase in the signal was noted with the added salts, again depending on the concentration of water and the nature of the solvent. In changing from (CH<sub>3</sub>)<sub>4</sub>N<sup>+</sup> to (C<sub>4</sub>H<sub>9</sub>)<sub>4</sub>N<sup>+</sup> in dimethylformamide, for example, the signal showed an almost three-fold increase attributable to differences in adsorption of the electrolytes to the electrode. Optimal conditions were determined for the analytical determination of lithium in the different solvent systems by AC polarography, which showed excellent agreement with results obtained by atomic emission spectrometry. Figures 3; references 16: 12 Russian, 4 Western.

[113-12172/12379]

NITROGEN-CONTAINING ORGANOSILICON COMPOUNDS. REPORT 123: STUDY OF BIOSTIMULATORY ACTIVITY OF SUCCINIC ACID TRIALKYLSILYLALKYLAMINOETHYL ESTER IODOMETHYLATES

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR: SERIYA KHIMICHESKAYA in Russian No 4, 1985 (manuscript received 28 Jan 85) pp 489-492

[Article by A. K. Yalynskaya, I. D. Segal, D. V. Reynkholde and E. Ya. Lukevits, Institute of Organic Synthesis of the Latvian SSR Academy of Sciences, and Institute of Microbiology imeni A. Kirkhenshteyn of the Latvian SSR Academy of Sciences]

[Text] Among compounds used in microbiological industry to intensify fermentation we can distinguish cytokinins, which are purine derivatives (kinetin, BAP [not further identified], zeatin and others), or compounds similar to them in structure and functions (derivatives of nitrogen-containing heterocyclic compounds--quinoline, pyridine etc.). Also used are compounds of the most diverse types including antibiotics (erythromycin, tetracycline, chloramphenicol) [1,2], surfactants [3], antioxidants [4], vitamins [5], specific precursors of the target product's biosynthesis, enzyme inhibitors--particularly aconitase inhibitors in citric acid biosynthesis [6] and so on. Most stimulatory compounds are active at low concentrations ( $10^{-3}$ - $10^{-8}$  M).

Succinic acid is known to have stimulatory activity, which can be explained by its role as a transfer unit in the Krebs cycle between  $\alpha$ -ketoglutaric acid and fumaric acid. Possessing an allosteric effect and influencing the most diverse enzyme systems, it can reduce the energy of activation of enzymatic reactions. On the other hand information exists indicating that organosilicon compounds can stimulate the growth of various plants (citrus plants, tomatoes, *Hevea brasiliensis*) ([7], p 396). This paper investigates new nitrogen-containing organosilicon compounds with the general formula



which are diiodomethylates of diesters of succinic acid and organosilicon amino alcohols. These diesters are derivatives of choline. Synthesized compounds contain two quaternary nitrogen atoms, and they are distinguished by the number of methylene groups between the nitrogen and silicon atoms ( $n=1,3$ ) and by the size of the alkyl radicals at the silicon atom in the case of trialkylsilylpropyl derivatives, when three methylene groups are

situated between the nitrogen and silicon atoms. Carbon analogues of these compounds containing a chain of 7 and of 10 carbon atoms in the substituent by the nitrogen atom--  $[\text{RN}^+(\text{CH}_2)_7 \times \text{CH}_2\text{CH}_2\text{OCO}]_2(\text{CH}_2)_2 \cdot 2\text{I}^-$ --were studied as well. The structure of the synthesized compounds is shown in Table 1.

Table 1. Iodomethylates of Succinic Acid Esters

[RN <sup>+</sup> (CH <sub>2</sub> ) <sub>n</sub> CH <sub>2</sub> CH <sub>2</sub> OCO] <sub>2</sub> (CH <sub>2</sub> ) <sub>2</sub> · 2I <sup>-</sup>			
No	R		
I	C <sub>7</sub> H <sub>15</sub>		
II	C <sub>10</sub> H <sub>21</sub>		

No	R <sup>1</sup> R <sup>2</sup> HSi(CH <sub>2</sub> ) <sub>n</sub>		
	n	R <sup>1</sup>	R <sup>2</sup>
III	1	CH <sub>3</sub>	CH <sub>3</sub>
IV	3	CH <sub>3</sub>	C <sub>2</sub> H <sub>5</sub>
V	3	C <sub>2</sub> H <sub>5</sub>	CH <sub>3</sub>
VI	3	CH <sub>3</sub>	C <sub>4</sub> H <sub>9</sub>
VII	3	CH <sub>3</sub>	C <sub>4</sub> H <sub>9</sub>
VIII	3	C <sub>2</sub> H <sub>5</sub>	C <sub>2</sub> H <sub>5</sub>

The stimulatory activity of the synthesized compounds was studied using lysine producer Brevibacterium 221 in relation to biosynthesis of lysine, nucleic acids and protein, and adenylate kinase activity. As we know, this enzyme is responsible for the level of all three adenine nucleotides, and for the direction and intensity of energy metabolism in the cells of plants, microorganisms and animals.

The research revealed some stimulatory effect on the part of small concentrations of these compounds (see Table 2). Compounds IV and V, which contain methyldiethyl- and dimethylethylsilylpropyl groupings, exhibit the greatest activity in relation to all tests with groups III-VIII of organosilicon derivatives of succinic acid. Their action is especially noticeable in relation to the enzyme adenylate kinase, the activity of which they stimulate by 44-56 percent at a concentration of  $10^{-6}$  M (succinic acid increases the activity of adenylate kinase by 61 percent at a concentration of  $10^{-7}$  M). Substitution of ethyl groups at the silicon atom in methyldialkylsilylpropyl derivatives (IV, VI, VII) by propyl and butyl groups generally leads to a decrease in activity, though compound VI at a concentration of  $10^{-6}$ - $10^{-7}$  has a more noticeable stimulatory action upon biosynthesis of lysine (succinic acid increases the lysine yield by 43 percent at a concentration of  $10^{-7}$  M). Triethylsilyl derivative VIII at a concentration of  $10^{-6}$  M has only an inhibitory action in all tests. Compound III, which contains one methylene group between the nitrogen and silicon atoms, manifests approximately the same kind of activity as do compounds IV and V.

Comparing compound II with its silicon analogue VIII, we can note that the former is somewhat more active. Compounds I and II generally manifest

Table 2. Activity of Succinic Acid Derivatives

Соединение (1)	Концентрация, М (2)	(3) Активность биосинтетических процессов от контроля, %			
		(4) Лизин	(5) Аденлат-киназа	(6) Белок	(7) Нуклеиновые кислоты
I	$10^{-4}$	94.3	156.3	81.3	114.7
	$10^{-5}$	121.3	103.3	85.0	122.7
	$10^{-6}$	111.0	98.3	86.3	114.7
	$10^{-7}$	91.1	92.8	97.7	107.3
II	$10^{-4}$	96.7	113.0	73.7	141.3
	$10^{-5}$	107.7	122.3	76.7	125.0
	$10^{-6}$	103.3	128.3	80.7	122.2
	$10^{-7}$	88.4	108.8	115.5	106.7
III	$10^{-4}$	100.4	108.7	86.3	113.3
	$10^{-5}$	108.7	96.0	88.7	121.3
	$10^{-6}$	104.6	130.0	100.3	106.5
	$10^{-7}$	94.0	83.0	89.0	107.7
IV	$10^{-4}$	116.3	82.1	84.0	94.3
	$10^{-5}$	113.4	119.4	114.4	142.9
	$10^{-6}$	103.5	144.4	113.6	95.5
	$10^{-7}$	109.8	130.4	95.6	85.7
V	$10^{-4}$	112.6	201.4	58.3	92.0
	$10^{-5}$	109.3	158.4	107.5	89.8
	$10^{-6}$	97.0	156.5	113.1	95.7
	$10^{-7}$	79.7	142.5	104.4	89.3
VI	$10^{-4}$	80.5	112.7	98.3	124.8
	$10^{-5}$	81.5	118.7	105.1	101.8
	$10^{-6}$	117.4	90.8	99.1	103.8
	$10^{-7}$	127.3	—	96.6	102.2
VII	$10^{-4}$	105.3	150.3	74.0	117.7
	$10^{-5}$	106.0	118.3	95.6	89.1
	$10^{-6}$	95.5	126.7	93.3	83.4
	$10^{-7}$	106.8	94.5	86.6	103.3
VIII	$10^{-4}$	87.0	147.6	95.4	109.4
	$10^{-5}$	93.6	106.6	104.5	87.3
	$10^{-6}$	95.7	84.6	95.5	88.5
	$10^{-7}$	95.7	—	103.3	104.4

## Key:

1. Compound
2. Concentration, M
3. Activity of biosynthetic processes, with respect to control, %
4. Lysine
5. Adenylate kinase
6. Protein
7. Nucleic acids

approximately identical activity, but compound II at a concentration of  $10^{-6}$  M stimulates adenylate kinase more noticeably (28 percent). Nonetheless the activity of compound II is inferior to that of the most active compounds, IV and V, in the series of organosilicon derivatives of succinic acid.

## The Experiment

Organosilicon amino alcohols were synthesized from trialkyl(chloroalkyl)silanes and N-methylaminoethanol in the presence of triethylamine in butanol medium. Iodomethylates III-VIII were obtained by processing methyl iodide by the products of interaction of trialkyl(2-oxyethylaminoalkyl)silanes with succinic acid chloranhydride [8].

2-(N-methyl-N-alkyl)aminoethanol was synthesized from alkyl bromide and N-methylaminoethanol in the presence of triethylamine in butanol medium. Reaction of amino alcohols with succinic acid chloranhydride produced esters out of which iodomethylates I and II were obtained by processing with methyl iodide [8].

The activity of the obtained compounds was analyzed using lysine producer Brevibacterium 221 on nutrient medium of the following composition (percent): sucrose--10;  $(\text{NH}_4)_2\text{SO}_4$ --2.5;  $\text{K}_2\text{HPO}_4$ --0.1;  $\text{KH}_2\text{PO}_4$ --0.13;  $\text{MgSO}_4$ --0.04; corn extract--5; pH 7.2. Fermentation was carried out in rocking 750 ml flasks in 30 ml nutrient medium in aerated conditions on a rocker (200 rpm). The substances were introduced at concentrations of  $10^{-4}$ – $10^{-7}$  M at the 20th hour of fermentation, at the beginning of intensive lysine synthesis. Samples were taken during culture growth to determine the concentration of lysine, protein and nucleic acids and the activity of adenylate kinase. Samples were taken for analysis at the 42d hour; following washing with tris-buffer (pH 7.6), the cells were disintegrated with ballotini [translation unknown] and centrifuged for 40 minutes at 14,000 rpm. Then lysine, protein, nucleic acids and adenylate kinase were determined in the supernatant [9-12]. The indicators were converted to milligrams of protein, and then the level of stimulation or inhibition was expressed as a percentage, adopting 100 as the control.

## Conclusions

Small concentrations of some nitrogen-containing organosilicon compounds (diiodomethylates of diesters of succinic acid and organosilicon amino alcohols) were discovered to have a stimulatory effect on lysine producer Brevibacterium 221, manifesting itself most noticeably in relation to the enzyme adenylate kinase.

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CSO: 1841/72



## SYNTHESIS OF 6-METHYL-2-THIOURACIL DERIVATIVES

Baku DOKLADY AKADEMII NAUK AZERBAYDZHANSKOY SSR in Russian Vol 41, No 6, 1985  
(manuscript received 28 Jun 82) pp 27-28

KULIYEV, F.A., GALSTYAN, K.A. and BABAKHANOV, R.A., corresponding member,  
Azerbaijan SSR Academy of Sciences, ITPKhT [expansion unknown], Azerbaijan SSR  
Academy of Sciences

[Abstract] 6-Methyl-2-thiouracil was synthesized by the reaction of acetoacetic ester with thiourea in methanol, a reaction catalyzed by  $\text{CH}_3\text{ONa}$ . Subsequently, a series of 6-methyl-2-thioalkyluracils was synthesized by the reaction of 6-methyl-2-thiouracil with various alkyl iodides in NaOH for 2 h at 85-90°C. References 2: 1 Russian, 1 Western.  
[79-12172/12379]

## LOW-TEMPERATURE INHIBITION STUDIES ON KINETIC CHARACTERISTICS OF BIOPOLYMERS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 9, 1985 (manuscript received 21 Sep 84) pp 2370-2372

STEPANOV, S.V., KHANGULOV, S.V., SHALOMEYEV, A.S., SEMENOVASHUKOVA, M.P. and BURBAYEV, D.Sh., Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Technical details are presented for low-temperature inhibition of bimolecular reactions in order to describe their kinetic characteristics. Combination of low-temperature stoppage of the reaction was combined with ESR analysis in studies on the reaction of myoglobin with azide. The reactants were ejected as a stream into isopentane at -142°C with analysis of the Fe that underwent transition from a high-spin to a low-spin state. The calculated rate constant for the reaction of  $(2.5 \pm 0.3) \times 10^3 \text{ M}^{-1}/\text{sec}$  was in good agreement with data reported in the literature on the bases of other methods. Thus, low-temperature stoppage of reaction can be combined with ESR spectroscopy as well as other methods to assess the kinetics of biochemical reactions. Figures 2; references 4: 2 Russian, 2 Western.  
[129-12172/12379]

SYNTHESIS STUDY OF CHEMISTRY OF POLYENE COMPOUNDS. REPORT 49. SYNTHESIS OF gas-(2E,4E)-3-METHYL-5-(2,6-DIMETHYL-6-ETHOXYCARBONYL-3-OXO-1-CYCLOHEXENE-1-YL)-2,4-PENTADIENAL AND gas-(2E, 4E,6E)-5-METHYL-7-(2,6-DIMETHYL-6-ETHOXYCARBONYL-3-OXO-1-CYCLOHEXENE-1-YL)-2,4,6-HEPTATRIENAL AND THEIR DERIVATIVES WITH DIMEDONE

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 21, No 8, Aug 85  
(manuscript received 11 Jun 84) pp 1653-1658

ZhIDKOVA, T.A., STASHINA, G.A., BOGDANOV, V.S., VAKULOVA, L.A. and SAMOKHVALOV, G.I., Scientific-Production Association "Vitamins", Moscow

[Abstract] One trend in the search for retinoids having improved system endurance is transformation of the functional group in retinoic acid. Thus, the dimedone derivative of retinal manifests considerable activity in differentiation control of epithelial tissue and lower toxicity as compared to retinoic acid. A previously prepared analog of vitamin A metabolite - C<sub>15</sub> retinoid - had a pronounced capability for suppressing intertwining tumor growth. In the present work previously unknown C<sub>15</sub> and C<sub>17</sub> aldehyde retinoids (the title compounds) and their dimedone derivatives were synthesized for the purpose of studying their biological activity. References 7:

4 Russian, 3 Western.

[123-12765/12379]

UDC 547.466 542.941

#### DEBLOCKING PEPTIDES BY USING PROTON DONORS

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 21, No 8, Aug 85  
(manuscript received 15 Jun 84) pp 1779-1787

KULIKOV, S.V., SOKLOVA, N.Yu. and SAMARTSEV, M.A., All-Union Scientific-Research Institute of Very Pure Biopreparations, Leningrad

[Abstract] Proton donors such as cyclohexene or cyclohexadiene are used to deblock or clear peptides containing protective groups such as benzyloxycarbonyl or nitro groups in peptide synthesis. To study the possibility of proton donor deblocking nitroarginine in the presence of tryptophan, 19 model di- and tripeptides containing various amino acid groups were synthesized and their deblocking with ammonium formate and cyclohexene was studied. Peptides containing both nitroarginine and tryptophan groups are readily deblocked with 20-25% yields. Hydrogenation of the indole ring of tryptophan takes place when the deblocking is carried out in an acid medium. Peptides containing nitro groups only are best hydrogenated in the presence of ammonium formate and cyclohexane, while those peptides which contain tryptophan

are best deblocked with cyclohexene in alcohol to prevent conversion of the tryptophan group. Peptides containing both nitroarginine and tryptophan may be hydrogenated with proton donors, but the yield is low. Figures 2; references 16: 3 Russian, 13 Western.  
[123-12765/12379]

UDC 547.85' 455

SYNTHESIS OF NUCLEOSIDES OF URONIC ACID. REPORT 1. STUDY OF METHODS OF SYNTHESIS OF 8-SUBSTITUTED ADENOSINE-5'-CARBOXYLIC ACID AND ITS ESTERS

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 21, No 8, Aug 85  
(manuscript received 15 Jun 84) pp 1795-1800

AKHREM, A.A., YERMOLENKO, T.M. and TIMOSHCHUK, V.A., Belorussian Scientific-Research Institute of Epidemiology and Microbiology, Ministry of Health, BSSR; Institute of Bioorganic Chemistry, BSSR Academy of Sciences, Minsk

[Abstract] Esters and amines of adenosine-5'-carboxylic acid and their derivatives have cardiotonic, antianginal and vasodilating properties. The latter is apparently due to structural similarity with adenosine which regulates blood pressure. In the present work various methods were employed to synthesize 8-substituted adenosine-5'-carboxylic acids and their esters. Thus, 8-bromo-2',3-O-isopropylideneadenosine-5'-carboxylic acid was prepared. The acids were esterified with alcohols in the presence of thionyl chloride to give the corresponding methyl and ethyl esters. References 16 (Western).  
[123-12765/12379]

UDC 547.857'455

SYNTHESIS OF NUCLEOSIDES OF URONIC ACID. REPORT 2. SYNTHESIS OF AMIDES OF 8-SUBSTITUTED ADENOSINE-5'-CARBOXYLIC ACID

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 21, No 8, Aug 85  
(manuscript received 15 Jun 84) pp 1800-1805

AKHREM, A.A., YERMOLENKO, T.M. and TIMOSHCHUK, V.A., Belorussian Scientific-Research Institute of Epidemiology and Microbiology, BSSR Ministry of Health, Minsk; Institute of Bioorganic Chemistry, BSSR Academy of Sciences, Minsk

[Abstract] It has been previously shown that the amides of adenosine-5'-carboxylic acid have vasodilating properties that exceed those of the corresponding acids. In the present work, amides of previously prepared adenosine-5'-carboxylic acid were synthesized. Amides, methylamides, dimethylamides and ethylamides of the corresponding acids which contain bromo-, amino-, methylamino-, dimethylamino-, ethylamino- and mercapto- groups in the 8-adenine position were prepared from the methyl ester of 8-bromo-2',

3-O-isopropylideneadenosine-5'-carboxylic acid and the ethyl ester of 8-bromadenosine-5'-carboxylic acid. The primary and secondary amines were shown to be selectively active in regard to the mixed ester and the 8-bromo-adenine groups which may be used to control the synthesis. References 3: 1 Russian, 2 Western.

[123-12765/12379]

UDC 541.183.24

#### MIGRATION OF POLYIONS BOUND TO SURFACES OF OPPOSITELY-CHARGED LATEX PARTICLES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 283, No 6, 1985 (manuscript received 15 Oct 84) pp 1409-1411

KABANOV, V.A., corresponding member, USSR Academy of Sciences, POLINSKIY, A.S., YAROSLAVOV, A.A. and CHECHIK, O.S., Moscow State University imeni M.V. Lomonosov; Institute of Biochemistry imeni A.N. Bakh, USSR Academy of Sciences, Moscow; All-Union Scientific Research Institute imeni S.V. Lebedev, Leningrad

[Abstract] In order to better appreciate the function of immunogenic preparations consisting of antigens bound to polyelectrolyte carriers in relation to immune cells, a model system was constructed in which negatively charged latex particles--with cell-equivalent size--were used to study the migration of adsorbed polyelectrolytes from particle to particle. The detection system consisted of fluorescence quenching of fluorescein isocyanate-labeled latex particles on reaction with poly-4-vinylpyridine alkylated with ethyl bromide (PVE). Binding of PVE to the labeled latex particles resulted in pH-dependent fluorescence quenching, indicating that the interaction was largely electrostatic. In addition, fluorescence recovery was seen on addition of unlabeled latex particles to fully quenched systems. These observations indicate that polyelectrolytes migrated from the labeled to the unlabeled particles, a migration that presumably occurs with antigen-bearing polyelectrolytes among immune cells in the genesis of an antibody response. Figures 3; references 9: 7 Russian, 2 Western.

[58-12172/12379]

DEACTIVATION OF POLYMETALLIC REFORMING CATALYST BY COKE

Minsk DOKLADY AKADEMII NAUK BSSR in Russian Vol 29, No 9, 1985 (manuscript received 13 Dec 84) pp 821-823

SENKOV, G.M., GORBATSEVICH, M.F., FEDOROVA, G.A. and KOZLOV, N.S., Academician of BSSR Academy of Sciences; Institute of Physico-Organic Chemistry, BSSR Academy of Sciences

[Abstract] This paper examines the influence, on the activity of polymetallic catalyst KR-104, of coke deposited under industrial reforming conditions. It uses model reactions of dehydrogenation of cyclohexane (taking place on the platinum) and of the conversion of normal octane (requiring both types of active centers). The dehydrogenation results show a linear relation between activity and the relative amount of coke deposited on the catalyst. For samples with up to 7 weight % coke, the increase of coke concentration lowered the conversion of normal octane and the yield of aromatic hydrocarbons. The degree of isomerization initially dropped and then remained practically steady with samples over 2.4 weight % coke. Isomerization apparently takes place on oxidative centers, but requires at least a trace of olefins, which can be provided by 0.1 weight % of platinum. Derivatographic analysis showed three exothermal effects at 250-300, 410-470 and 500-560°C. Apparently the first stage corresponds to the combustion of coke on the metallic active centers. During oxidative regeneration, coke near platinum atoms reacts first, while oxidation of coke on the alumina proceeds at more elevated temperatures. Overall, the analysis indicated that under industrial conditions, coke forms first on the metallic centers and, at later process stages, primarily on the oxidative centers of the substrate. Figures 2, references 10: 6 Russian & Western.

[100-12672/12379]



## CATALYTIC CHARACTERISTICS OF VARIOUS SYNTHETIC HIGH-SILICON ZEOLITES

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 9, 1985 (manuscript received 21 Nov 83) pp 2173-2176

YUSHCHENKO, V.V., TOPCHIYEVA, K.V., (deceased), MEGED, N.F. and LIMOVA, T.V., Chemistry Faculty, Moscow State University imeni M.V. Lomonosov

[Abstract] Studies were conducted on the factors determining catalytic properties of high-silicon zeolites synthesized by the seeding method from three different aluminum silica gels. Crystallization was carried out in an autoclave at 423°K for 120 h. The adsorptive capacity of the ZSM-5 zeolites for n-heptane under batch conditions was quite similar for all three samples and equivalent to 0.16-0.17 cm<sup>3</sup>/g. The effective rate constant for the cracking of n-octane decreased proportionally to an increase in the SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> ratio (ratio of 26 = 4.8 μmoles/g·sec; 31 = 4.0 μmoles/g·sec; 39 = 3.0 μmoles/g·sec at 743°K), while maintaining a relatively stable energy of activation (9-10 kcal/mole). Thermal desorption curves for ammonia were similar for all three zeolites, and corresponded to the activities (i.e., SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> ratios) of the catalysts. The selectivity of cracking with low levels of conversions was similar for all three samples, but varied markedly with high levels of conversion. Figures 1; references 11: 6 Russian, 5 Western.  
[129-12172/12379]

## EFFECTS OF HEAT TREATMENT UNDER ARGON ON ELECTROCATALYTIC BEHAVIOR OF RHODIUM

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 9, 1985 (manuscript received 23 Nov 83) pp 2177-2180

PLETYUSHKINA, A.I., MASHKOVA, L.P., BARANNIK, I.V. and VOVCHENKO, G.D., (deceased), Chemistry Faculty, Moscow State University imeni M.V. Lomonosov

[Abstract] An assessment was made of the effects of heat treatment (300-600°C) conducted under argon on electrolytically deposited rhodium--on platinum support--in terms of electrocatalytic activity. Data derived for the structural, adsorptive and catalytic parameters demonstrated that the firing markedly diminished adsorption of hydrogen in the 400-500°C range. Furthermore, electrocatalytic reduction of maleic acid showed two temperature-related peaks: at 300-400°C and at 500-600°C. These results of heat treatment was ascribed to the fact that the rhodium deposit increased in density, without a fundamental change in its dendritic structure. The primary changes in the crystalline structure of rhodium occurred within the temperature spans of 300-400 and at 600°C. Figures 3; references 11: 10 Russian, 1 Western.  
[129-12172/12379]

## CATALYTIC CHARACTERISTICS OF COBALT AND IRON PHTHALOCYANINES SUPPORTED ON SILICA GEL

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 9, 1985 (manuscript received 14 Apr 82) pp 2304-2305

BORISENKOVA, S.A., YEROKHIN, A.S. and NOVIKOV, V.A., Chemistry Faculty, Moscow State University imeni M.V. Lomonosov

[Abstract] A study was conducted on the effects of the method of application of Co and Fe phthalocyanines on silica gel on the catalytic activity of these compounds in isopropanol dehydrogenation and dehydration. Direct synthesis of Co phthalocyanines on silica gel resulted in a catalyst with high dehydration activity, but lacking dehydrogenation activation. Studies with the Fe compound showed that the catalyst prepared by mixing the phthalocyanine with silica gel also showed enhanced activity in dehydration but not in dehydrogenation activity. The changes in silica-gel-supported catalysts was attributed to some specific surface effect influencing sites responsible for promoting dehydration. Figures 1; references 4: 2 Russian, 2 Western.  
[129-12172/12379]

UDC 661.183

## MAGNESIUM, MANGANESE, NICKEL AND COPPER HYDROSILICATES OBTAINED BY ADSORPTION

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 30, No 9, 1985 (manuscript received 29 Dec 83) pp 2423-2426

ROSLYAKOVA, N.G., SKORIK, Yu.I., MAKASHOVA, N.Ye. and KUCHAYEVA, S.K., Leningrad Technologic Institute imeni Lensovet; Institute of Chemistry of Silicates imeni I.V. Grebenshchikov, USSR Academy of Sciences

[Abstract] Thermogravimetric and roentgenophase study of products of conversion of colloidal polysilicic acid with ammoniacal buffer solutions of salts of metals is described and discussed. Interaction of colloidal polysilicic acid with solutions of ammoniacal salts of bivalent cations of magnesium, manganese, nickel and copper produces corresponding hydrosilicates. Chemical and physical chemical study of products of conversion of polysilicic acid in solutions of salts of the bivalent cations of the metals revealed the nature of the cations forming during this and the nature of changes occurring after thermal processing of them. Figures 2; references 7 (Russian).  
[69-2791/12379]

## THERMAL DEGRADATION OF AMMONIUM PERRHENATE IN HYDROGEN SULFIDE ATMOSPHERE

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 30, No 9, 1985 (manuscript received 29 Mar 84) pp 2429-2431

DOVLYATSHINA, R.A., KURBANOV, T.Kh. and GUSEYNOVA, S.M., Institute of Inorganic and Physical Chemistry, AzSSR Academy of Sciences

[Abstract] Study of the interaction of ammonium perrhenate with hydrogen sulfide as a method of producing ReS is described and discussed. Behavior of ammonium perrhenate in an  $H_2S+H_2$  atmosphere was studied at 280°, 480° and 800°C. Production of  $ReS_2$  from ammonium perrhenate in an  $H_2S+H_2$  atmosphere requires heating up to 800°C for 4 hours and subsequent homogenizing firing at 800°C for 60 hours. Intermediate products of the reaction are named and discussed briefly. Figure 1; references 13: 3 Russian, 10 Western. [69-2791/12379]

IR-SPECTROSCOPIC STUDY OF IRON-ALUMINUM CATALYSTS IN SYNTHESIS OF HYDROCARBONS FROM CO AND  $H_2$ 

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 9, Sep 85 (manuscript received 25 May 84) pp 1950-1954

ZAYTSEV, A.V., TSAPKINA, M.V., SAVELYE, M.M., BOROVKOV, V.Yu., LAPIDUS, A.L. and KAZANSKIY, V.B., Institute of Organic Chemistry imeni N.D. Zelinskiy, USSR Academy of Sciences, Moscow

[Abstract] An attempt was made to characterize the state of Fe on the surface of catalysts prepared by deposition of  $Fe_3(CO)_{12}$  on  $Al_2O_3$  and modified with KOH; to achieve this, IR spectra of adsorbed CO were measured in diffusely dispersed light. Activity of such catalysts in conversion of CO and  $H_2$  to hydrocarbons was evaluated. The activity of catalysts increased with increased content of K, going through a maximum at 8% K. Methane content increased gradually in the reaction mixture while content of olefines diminished. Analysis of spectral data indicated that decomposition of Fe carbonyls on the surface of non-modified catalysts leads to oxidized Fe which cannot be reduced even at 673K. Introduction of K prevented oxidation of Fe and at K > 9% practically all Fe on the surface of the catalyst is reduced. Catalysts with < 2% K were inactive in synthesis of hydrocarbons from CO and  $H_2$ ; oxidized Fe does not participate in the reaction. Catalysts with > 3% K are active on account of the reduced iron and the decrease in the activity of the catalysts with > 9% K is due to partial shielding of the metallic catalyst by K and

carbonization of the catalytic surface. Nitrogen oxide could not be used as a test of the state of Fe on the surface of the catalysts. Figures 3; references 13: 3 Russian (1 by Western author), 10 Western.  
[130-7813/12379]

UDC 541.128:547.315.2

#### AROMATIZATION OF PIPERYLENE OVER ALUMINUM OXIDE WITH DEHYDROGENATING ADDITIVES

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 9, Sep 85 (manuscript received 17 May 84) pp 1961-1965

MINACHEV, Kh.M., RYASHENTSEVA, M.A., GITIS, K.M. and BELANOVA, Ye.P., Institute of Organic Chemistry imeni N.D. Zelinskiy, USSR Academy of Sciences, Moscow

[Abstract] Reactions of piperylene on  $Al_2O_3$  containing  $K_2O$  additives were studied. The levels of  $K_2O$  were studied which neutralized acid centers of  $Al_2O_3$  and higher levels which intensified the dehydrogenation activity of the catalyst as well as the catalysts containing  $Al_2O_3$  and rare earth element oxides. The results indicated that aluminum-potassium catalyst could dehydrogenate only alkylcyclohexadienes, i.e., products obtained by condensation of two piperylene molecules. Increased content of  $K_2O$  led to higher yields of  $C_{10}$ -arenes. Chromium-containing catalysts were capable of eliminating a hydrogen molecule from piperylene followed by its cyclization to cyclopentene and cyclopentadiene. Aromatic hydrocarbons yielded benzene and toluene over chromium-containing catalyst. References 12: 10 Russian, 2 Western.  
[130-7813/12379]

UDC 541.128:549.67:542.953:547.281.4

#### CATALYTIC PROPERTIES OF X AND Z TYPE ZEOLITES IN CONDENSATION OF BUTYRALDEHYDE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 9, Sep 85 (manuscript received 16 May 84) pp 1965-1971

ISAKOV, Ya.I., USACHEV, N.Ya., ISAKOVA, T.A. and MINACHEV, Kh.M., Institute of Organic Chemistry imeni N.D. Zelinskiy, USSR Academy of Sciences, Moscow

[Abstract] In an attempt to explain the nature of active centers in the catalysts used in crotonic condensation of butyraldehyde (BA), cationic modification of synthetic X and Y zeolites was studied along with a number of other industrial catalysts. It was shown that BA could be converted to 2-ethylhexenal over the synthetic X and Y zeolites at atmospheric pressure and 100--200°C. The crystallites containing  $Na^+$ ,  $K^+$ ,  $Rb^+$  and/or  $CS^+$  cations exhibited properties of solid bases.  $M^+NaX$  compounds were stronger catalysts than  $M^+NaY$ ,  $M^{n+}NaX$  and  $M^{n+}NaY$ .  $NiNaX$  dehydrated in air could only catalyze the



condensation of BA to 2-ethylhexenal and appeared to be a monofunctional catalyst. Polyfunctional systems could be obtained by treating zeolite with hydrogen at 350--400°C and reduction of  $\text{Ni}^{2+}$  to  $\text{Ni}^0$ ; such systems accelerated BA condensation and hydrogenation of carbonyl compounds. Over these catalysts, reaction of BA with  $\text{H}_2$  yielded 2-ethylhexenal and 2-ethylhexanol. The activity of the system zeolite-transition elements depends on its pretreatment, valence, physical state and localization of the transition element. Figures 3; references 15: 11 Russian (2 Western), 4 Western (2 Russian authors).  
[130-7813/12379]

UDC 66.094.37:661.786.23

#### SELECTED ASPECTS OF CHEMICAL TRANSFORMATIONS IN CATALYTIC OXIDATION OF TRIALKYLALUMINUM COMPOUNDS

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 9, 1985 pp 517-519

RUMYANTSEVA, M.R., MELNIKOV, V.N., MAYOROV, M.B., KOSOVA, L.F. and VLADIMIROVA, L.I.

[Abstract] An analysis was conducted on the effects of the time of catalyst introduction on the formation of byproducts (paraffins, carbonyls, acids, esters) in the oxidation of trialkylammonium compounds. The model system utilized consisted of oxidation of tridecylaluminum under the following temperature conditions: first 1.5 h at 40°C, followed by 3 h at 32°C, and then for 1 h at 50°C. The two catalysts tested were  $\text{TiCl}_4$  and  $\text{Ti}(\text{OR}')_4$ , where  $\text{R}' = \text{n-C}_4\text{H}_9$ ,  $\text{iso-C}_3\text{H}_7$ , or  $\text{n-C}_{10}\text{H}_{21}$ . The resultant data demonstrated that within the concentration range of 0.1-2 mole% increasing the concentration of the catalyst to 2 mole% leads to a marked decrease in the formation of oxygen-containing byproducts. However, for reasons of economy and to prevent contamination of the product with titanium hydroxide, a catalyst concentration of 0.5 mole% is recommended. In addition, the optimal time of catalyst introduction is at the stage at which oxidation of the second Al-C bond to Al-OH commences (to reduce the concentration of oxygen-containing byproducts to a minimum). Figures 1; references 10: 4 Russian, 6 Western.  
[133-12172/12379]

UDC 66.094:46:[661.7:547.412.733.45]

#### INTERPHASE CATALYSTS FOR ALKALINE DEHYDROCHLORINATION OF CHLOROPARAFFINS

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 9, 1985 pp 519-520

NAGAYEV, R.M., KOLBIN, A.M., PRUSENKO, B.Ye., VALITOV, R.B., IMASHEV, U.B. and KOSHKAROV, Ye.V.

[Abstract] Trials were conducted on defining effective catalysts for dehydrochlorination of chloroparaaffins, following determination that classical



interphase catalysts--tetrabutylammonium iodide, tetrabutylammonium bromide, and triethylmethyammonium iodide--were ineffective. Kinetic studies on dehydrochlorination demonstrated that 146-160 MW polyamines were effected and functioned as both surfactants and catalysts. Thus, the energy of activation for the dehydrochlorination of 1,1,2,2,3-pentachloropropane (I) was reduced from 37.6 kJ/mole to 24.8 kJ/mole in the presence of 2% polyamines. In addition, the order of the reaction in I and 5-chloropentanone-2 was equal to 2, and in 1,1,2,2-tetrachloroethane to 1.5. The values were compatible with a bimolecular mechanism of dehydrochlorination. The order of the reaction was less than 1.0 in polyamines, again showing compatibility with a catalytic mechanism of action. Figures 2; references 3 (Russian).  
[133-12172/12379]

UDC 541.64:546.821:547.313.2

#### SUPPORTED Ti-Mg CATALYST FOR ETHYLENE POLYMERIZATION

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 9, Sep 85  
(manuscript received 20 Jan 84) pp 1840-1844

PAKHA, I. and NOVAKOVSKA, M.

[Abstract] An analysis was conducted on a Ti-Mg catalyst used for polyethylene synthesis, in which the Mg support was prepared by reaction of  $MgCl_2$  with  $AlEt_2Cl$  in n-hexane at room temperature, and, eventually, treatment with  $TiCl_4$  at 410°K. Analysis of the efficiency of ethylene polymerization at 333°K under a pressure of 0.6 MPa indicated the formation of two active catalytic sites, attributable to Ti(III) and Ti(IV).  $TiCl_3$  was formed by reduction of  $TiCl_4$  by the organoaluminum compound, and layered on the surface of the catalyst, while Ti(IV) remained bound in the latticework of the catalyst. As a result, the total Ti content of the catalyst increased because of  $TiCl_3$  deposits, and the yield of polyethylene per 1 gm of Ti decreased with an increase in Ti content. However, the yield of polyethylene per 1 gm of catalyst remained constant. Uniform deposition of  $TiCl_3$  on  $MgCl_2$  led to blocking of the Ti(IV) sites, with activity of the catalyst residing in the superficial monomolecular layer of  $TiCl_3$ . Analysis of the kinetics showed that the rate constants for the Ti(III) and Ti(IV) were quite similar, i.e.,  $14.1 \pm 0.3$  and  $11.4 \pm 0.9$  liters/mole·min, respectively. The differences in the yield of polyethylene produced by different samples of the catalyst are due to the relative contributions of the two types of active sites. Figures 5; references 8: 7 Russian, 1 Western.  
[94-12172/12379]

## CHEMICAL INDUSTRY

### SHAMPOO FROM FISH OIL

Moscow TEKNIKA I NAUKA in Russian No 8, 1985 p 10

[Article by A. Veledintskiy, Tallin: "Shampoo from Fish Oil" under the rubric: "In the Leading Organizations of the Scientific and Technical Society (NTO)"]

[Text] Waste water at fish industry enterprises contains many valuable substances -- proteins, fats, various enzymes. All this is extracted during water purification and is sent to the dump. In just one fishing collective, that imeni S.M. Kirova in Estonia every day about 1,000 cubic meters of such wastes were sent to the dump. But is there no way to use them? The management of the collective presented this question to the scientists of the Institute of Chemistry of the Estonian SSR Academy of Sciences.

As a result of joint work of the collective's design bureau engineers, the members of the NTO for Machine Building, and the scientists from the institute there was created a new way for processing the fats and producing surfactive substances (PAV) from them. And what is then done with them? "First," states a representative of the lead organization of the NTO, V. Ein, "we wanted to make soap, but it turned out that it smelled of fish. Then we tried shampoo. And it worked! The complex fat molecules during processing change their root structure, as a result of which the fish smell disappears."

Four million bottles, 1,000 tons of shampoo per year will be produced in the new shop of the fishing collective. Economists calculate that it will pay for itself in one and one-half years, and then will operate at 1.2 million ruble per year profit. But these millions are by no means all the good from such production. We must also note that use of no-waste technology also means that there is a decrease in pollution of the environment and a savings of money, which today is wasted on purchasing imported surfactants. The new business will also interest the scientific and technical society for food production, since now there has appeared the capability to process non-food fats and other waste from meat plants. Since today we have in our country tens of thousands of tons of natural fats going to waste, the use by the food industry of no-waste technology of the Estonian engineers will allow us to kill two birds with one stone -- we will increase the production of shampoo and prevent pollution of the environment by meat packers.

It remains only to add that the Estonian shampoo from fish oil is not at all different from common shampoo. It has a very pleasant smell. It has passed tests for technological and for dermatological action at the Institute for Experimental and Clinical Medicine of the Estonian SSR.

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## WASTE-FREE PREPARATION OF CHROMATOGRAPHY ADSORBENT

Moscow TEKHNIKA I NAUKA in Russian No 8, 1985 p 10

[Article, unsigned: "To Pulverize Without Waste" under the rubric: "Laureates of the All-Union Scientific and Technical Society Prize"]

[Text] In many branches of industry there are requirements for granular material of a specific granulometric makeup. It is especially important that the grains be of a uniform size in production of chromatographic sorbents -- granular materials through which the substances being studied are passed during chromatographic analysis. Chromatography is used in chemistry, physics, biology, and medicine; it is used as a preliminary method for separating high purity substances. The more sorbents are produced, the more rapidly grow the wastes (up to 40%). These are as a rule larger particles than are needed. The wastes which are formed, for example at enterprises which produce polymer sorbents, are burned, polluting the environment. Another problem which could not be solved by technology is the manufacture of polymer sorbents with a particle size no less than 50 micrometers. These are needed for specific types of chromatography.

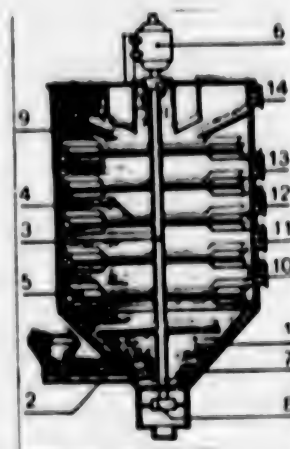
Now these problems have been solved. This was done by an engineer from the Moscow Chemical and Technological Institute imeni D. I. Mendeleyev, Candidate of Technical Sciences S. Arutyunov and a Scientific Fellow of the Moscow Technological Institute for the Food Industry Yu. Sultanovich. They have developed a mathematical model for a crushing process of granular materials in an apparatus with an impact principle of operation.

Using the mathematical modeling on a computer the inventors studied the basic mechanism of the crushing process and solved the tasks of its optimization. On this basis they created a test industrial sample of a new centrifugal crushing apparatus (see the illustration) and a new method for crushing granular material. Perfection of this apparatus at the Olayskiy Plant for Chemical Reagents of the "Biokhimreaktiv" Scientific and Industrial Association has allowed the creation of no-waste technology for the production of polymer sorbents and to attain an annual savings of 160 thousand rubles.

In 1984, S. Arutyunov and Yu. Sultanovich became Laureates of the Third Prize from the VSNTO for young scientists and specialists for exceptional work in the area of science and technology.

The scheme for the impact-centrifugal unit for crushing granular materials: 1 - the body; 2 - screw feeder; 3 - shaft; 4 - rod; 5 - V-shaped blades which rotate vertically; 6 - electric motors; 7 - gas-separation net; 8 - bearing; 9 - baffle; 10, 11, 12, 13, 14 - exhaust pipes.

The material is inserted at the separation net and fluidized by a flow of air. The shaft (3) rotates and pushes the air to the walls of the body, where it is removed through holes 10-14. As a result of the entering flow to the extent that there is movement along the axis of the shaft it loses its speed. The material from the suspended layer, which was supported by the passing air flow, is pulverized from the impact of the mechanical action of the rods (4) and blades (5). Since the speed of the passing air flow is constantly decreasing, particles of various sizes are distributed by rate of movement, that is by the height of the body.



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## NEW ACOUSTIC DEVICE USED TO MIX LIQUID AND GAS

Moscow IZOBRETATEL I RATSIONALIZATOR in Russian No 10, 1985 pp 18-19

[Article by P. Yermakov, Dnepropetrovsk: "To Mix Without Stirring"]

[Text] In the Dnepropetrovsk Chemical-Technological Institute (DCTI), scientists have created acoustic contact devices which accelerate the process of saturating a liquid with gas.

Using an everyday siphon to get carbonated water, we do not suspect that the same task is not so simple to resolve in industrial volumes. In order to saturate a liquid with gas a great deal of energy must be consumed for stirring. Specialists of DCTI succeeded in mixing a gas and a liquid without great energy costs by allowing it to flow through an acoustic generator with a ring-shaped resonating cavity.

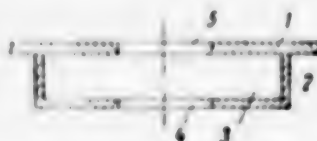
A high-school physics course teaches that turbulent (swirling) currents are mixed more rapidly than laminar ones. In order to make a flow of liquid or gas turbulent, it is necessary to create the required vibrations in the volume. For a long time engineers proceeded as follows: they placed devices with vortex and rotating magnetic fields in the flow (author's certificate No 709 107, 1 005 811, 1 015 122), and magnetic-impulse apparatus (author's certificate No 626 786, 671 826, 1 005 814). But as it turned out, this apparatus is not long-lasting, it is complex, and the most important thing--the cost of the energy to operate the devices is high, moreover this cost increases much more rapidly than the rate of mixing.

Studying the processes in a gas-liquid system, specialists of the Dnepropetrovsk Chemical-Technological Institute became convinced that stirring the entire volume is pointless labor. It is quite enough to disrupt the extremely thin border layer between the gas and liquid flows. And acoustic vibrations are best able to handle this job. But unfortunately, in a gas-liquid environment, acoustic vibrations die out practically completely after a distance of 10 cm. In order to maintain them, a large number of centers for generating the vibrations must be created throughout the entire volume of the apparatus. And this means that again it is necessary to place acoustical generators in the apparatus--complex, short-lived, and energy-consumptive. This is no less expensive than devices working in a magnetic field.

And what if you create autovibrations in a gas-liquid flow, which a minimum of energy is required to maintain? Research by engineers of DCTI proved that when gas or liquid is passed through the opening of a generator with a ring-shaped resonating cavity, autovibrations with a frequency of several thousand Hz occur in the flow. The frequency of the autovibrations is proportional to the flow rate and inversely proportional to the size of the ring-shaped resonating cavity. By selecting the size and shape of the openings, scientists were able to direct the greater part of the energy of the current toward creating autovibrations. So it became unnecessary to use energy from outside.

The first acoustic contact device (author's certificate No 423 481) is not large and has no moving parts. The device underwent testing in mixing oxygen with a solution of sodium sulfite in a bubbling column. The saturation process was accelerated by an average of 1.5 times, and the economic effect totaled 300,000 rubles.

The generation of autovibrations was based on other acoustic contact devices (author's certificate No 1 037 927, 1 057 052, 1 114 431). The Lisichansk Soda Plant imeni Lenin introduced an experimental-industrial bicarbonate column with a diameter of 2.4 meters. Its productivity was successfully increased by 15 percent. In one of the machine-building combines, a chemisorber with a diameter of 0.6 meters is operating to purify cyanide-containing wastewaters with an ozone-air mixture. For developing and adopting chemisorbers with acoustic contact devices to treat cyanide-containing wastewaters with ozone, the Dnepropetrovsk scientists were awarded medals from the USSR Exhibit of Economic Achievements. The Dnepr Brewing Combine in Dnepropetrovsk is using a saturator with the new devices to saturate nonalcoholic drinks with carbon dioxide. The productivity was doubled and the metal consumption was decreased to one-fourth. In the Radioizmeritel Plant in Kiev, the devices are purifying wastewaters from galvanizing shops.



Schematic of a simple acoustic contact device: 1--base, 2--pan, 3--ring-shaped resonating cavity, 4--opening in the pan, 5--opening in the base.

In addition, designs have been worked out for devices which will be used in heat-exchange apparatus, and in acoustic jets. Devices have also appeared which significantly accelerate the process of dissolving a solid substance in a liquid.

Although a number of new designs have already found application, the scale of their adoption might be greater. It is particularly important that acoustic contact devices can be used to fit out not only new facilities but also to modernize old ones at a minimal cost, substantially raising their productivity.

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## DOMESTIC TECHNOLOGICAL DEVELOPMENTS URGED

Moscow IZOBRETATEL I RATSIONALIZATOR in Russian No 8 Aug 85 pp 4-5

[Article by A. Kuzin, chief project designer at the "Energotekhprom" [Power Engineering and Technical Industry] experimental technical enterprise under the USSR Ministry of Power and Electrification, and author of 15 inventions: "To Buy or Introduce?"]

[Text] The purchase of licenses for some technological processes can not only accelerate, but also retard the resolution of important technical problems and lead to a voluntary rejection of leadership. The creation of new, efficient technologies that liberate the country from costly purchases is the task of intersectorial cooperation that brings specialists in different areas together to resolve a common problem.

"...many developments become obsolete before they even provide a real economic effect. At the same time, when the results of our developments end up abroad, they are used very effectively. As a result it is sometimes necessary to purchase materials and equipment abroad that were manufactured under our own licenses." B. Ye. Paton, president of the USSR Academy of Sciences (PRAVDA, 3 January 1985)

At a general assembly of the USSR Academy of Sciences, the Academy's president, A. P. Aleksandrov, stated that the top-priority task is to create efficient technologies that will liberate the country from the costly import of materials and equipment. We can use the construction of contact cooling towers as an example of the urgency of this task.

...The Novovorenzh Atomic Power Station imeni the 50th Anniversary of the USSR cannot increase its output of electrical power because the circulating water is not cooled adequately: asbestos-cement sprinklers have become "overgrown" and there is nothing to replace them with. Chemists cannot increase the output of material for the cooling towers because their own cooling towers are useless. This is a vicious circle.

Cooling towers are used at enterprises in many sectors--the power, chemical, metallurgy, and other industries. The sprinkler is the functional unit of these structures. The sprinkler sprays out water, which is then cooled by a stream of air. The sprinklers are made of asbestos-cement sheets or wood. Builders and workers in the production process are not satisfied with either of these materials: asbestos-cement is heavy and brittle, and in order to support it an entire system of columns, cross-bars, and girders has to be erected. Wood is not very durable and it is expensive. The situation has reached the point where what is supposed to be an ancillary, secondary technological unit has started to retard the development of various industries. We have the phenomenon of "the technical seduction" of society, about which G. A. Kulagin wrote in the article "Seduction by Science" (IZOBRETATEL I RATSIONALIZATOR, September 1984). How can this demand be met? What can be used to replace traditional materials? Many institutes have been carrying out research for dozens of years, dissertations have been defended, patents have been obtained. Unfortunately, the new solutions that appear are distinctive, but not of great practical use. Recommendations are issued (to whom, for what?), reports are written, topics are opened up once again so that in a year or several years the entire circle can be repeated.

It is time to realize that scientific research institutes cannot provide actual components and designs. They do not have a mechanical base, materials, or equipment, and therefore under the best circumstances scientific research developments end with the publication of recommendations.

A research laboratory at an enterprise could operate more effectively than another departmental scientific research institute. But the production workers who could set up the production of new designs have another problem: they cannot manufacture the accessory equipment, so they have no reserves, the plan has consumed everything.

I will cite an example of how complicated it is to manufacture accessory equipment. Besides the sprinklers, those same cooling towers are fitted with moisture traps. Absence of these traps leads to huge losses of water through the discharge of steam into the atmosphere. Anyone who lives near a cooling tower is aware of this moisture. When the wind blows towards the homes, the residents cannot open their windows because everything would get wet. In 1982 the "Energoprompolimer" [Power Industry Polymer] Special Design and Technological Bureau designed equipment for producing moisture traps, but has still not been able to manufacture it. Its "own" plants, that is the plants under the USSR Ministry of Power and Electrification, find reasons not to manufacture the equipment, while other organizations say "we'll do this for you if you do this for us." At one plant, as soon as they found out that we were from the power industry, the workers promised to produce the equipment if we would help in linking up a 1000 kilowatt transformer: a complicated problem when there is an energy shortage. Once again the order was not accepted. This is also the situation with equipment for the sprinklers.

When science and technology fail for years to meet growing demands, you get the idea that there is no sense in waiting and looking for some domestic development, but that you should go abroad where you can find help. Firms there vie with each other to offer their developments, which are often old,



just to get them sold. They resolved the problem a long time ago and are making the sprinklers out of plastic. And at this stage they hastily gather evidence that our industry cannot produce the equipment being offered by that firm. Therefore it is absolutely necessary to spend foreign currency on acquiring the license and equipment.

Is this always necessary? I remember a group of construction specialists that went to take a look at the production of plastic sprinklers. As a developer of new sprinkler designs, I was interested in the results of this trip, and I gave the group a list of questions. They returned, and I inquired about the type of plastic used to make the sheets. They happily told me: "Oh, now we know exactly, we even brought some samples. It's made from white and black plastic!" I didn't ask any more questions. Sometimes after trips like this a decision is made to purchase some technological equipment...And such incompetent people not only do not help matters, they often distort and confuse the issue.

The problem like the one discussed in this article is of interest to many departments and it must be resolved jointly and for everyone concerned, not just on a departmental basis. Some might say: We have enough foreign currency, this isn't really a problem for our ministry, and the others can deal with it as they wish. This approach to the problem is harmful. Economically it is wasteful; technically it is a yielding of one's position, a voluntary rejection of leadership; socially it denies work to specialists, it shows a lack of trust in them, indicates that their work is no good, and expenditures on it are wasted.

Supporters of the "realistic approach" will counter this by saying that we need sprinklers, not just good, fundamental concepts.

Well, let's take a look at how we can do a better job of meeting the technical demand that has arisen.

In January 1984 four organizations--the All-Union Corrosion Scientific Research Institute, the All-Union Petroleum Machine Building Scientific Research Institute, the All-Union Hydrogeology Scientific Research Institute, and the "Energotekhprom" [Power Engineering Industry] Experimental Planning and Technical Enterprise--signed an agreement on creative cooperation to redesign the SK-400 cooling tower at the "Orgsintez" [Organic Synthesis] Production Association. The participants in this unusual "joint stock company" belong to different ministries, but their tasks are the same. The agreement distributes the responsibilities as follows: the Corrosion Institute is drawing up the plan for redesigning the tower and it is supplying the materials, the Petroleum Machine Building Institute and the Hydrogeology Institute are testing the design of sprinklers made of corrugated plastic-polymer pipes (Patent No. 907 385), and the "Energotekhprom" enterprise is working out a design for the connecting elements. All the points of the program have been carried out. The production of connecting elements has been organized at the "Organsintez" Production Association, along with assembly of the sprinkler units.

In 1985 reconstruction of cooling towers will begin at other enterprises as well. New sprinkler designs made of plastic will be tested. All of these are



our own, Soviet designs and they can be manufactured using Soviet equipment. They not only are not worse than foreign models, they are much more efficient in terms of the consumption of materials, construction and transportation costs, and a number of other indicators.

This sort of example of joining forces is interesting because other departments and organizations moved to take part in resolving the cooling tower problem. It is possible that after the State Committee for Science and Technology recognizes this topic, which is of great national economic importance, a brigade will be created and a program will be drawn up that will meet the needs of all the parties involved. To carry out this program an organization such as Tallinn's "Effect" (IZOBRETATEL I RATSIONALIZATOR, March 1984, p 6) is needed, where it is not "science" that is required, but where designers and workers are active. The foreign currency that is saved could be used to develop production of instruments and devices needed to introduce new technologies and equipment, which in turn would contribute directly to a reduction in imports of unnecessary technology, which is something we have been discussing for decades.

A new legislative document adopted in 1984 and confirmed by the USSR State Committee for Science and Technology--the Provision on a Temporary Collective for Conducting Work to Resolve Long-Term Scientific and Technical Problems of an Intersectorial Nature, for Creating and Introducing into Production New Equipment, Technology, and Materials (IZOBRETATEL I RATSIONALIZATOR, November 1984, p 16)--is a powerful stimulus for uniting specialists in various fields to meet technical needs that arise. The emergence of temporary collectives of this nature will speed up (practically without additional reorganization and expenditures) the resolution of many problems involved in the creation and introduction of new technology.

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## WORK OF SCIENTIFIC INSTITUTIONS OF LATVIAN SSR ACADEMY OF SCIENCES

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 8, 1985 pp 21-29

[Excerpts] In one of its meetings the Presidium of the USSR Academy of Sciences examined the work of scientific institutions of the Latvian SSR Academy of Sciences in the areas of creating new materials, biotechnology, medical preparations and automation of scientific research. A report was given by the president of this academy, USSR Academy of Sciences Corresponding Member B. A. Purin. The speaker described the basic accomplishments of academy institutes in the areas of research named above and in some others, focusing his attention chiefly on practical uses of the obtained results in the national economy.

The Institute of Polymer Mechanics developed the theoretical principles of the processes of reinforcement, filling, deformation and breakdown of polymer and compound materials, and it created the methods and resources for nondestructive analysis of these processes. The Physical Energy Institute investigated electronic phenomena in organic molecular crystals. The Institute of Inorganic Chemistry developed the physicochemical principles of plasma-chemical processes, and a plasma procedure for obtaining high-melting materials in the form of ultradispersed powder. This procedure has already enjoyed practical application.

Significant successes were achieved in synthesis of new physiologically active substances. This work by the Institute of Organic Synthesis is sufficiently well known, said B. A. Purin, and there is no need to dwell on it once again. It can be noted that the Institute of Organic Synthesis was awarded the challenge Red Banner of the CPSU Central Committee, the USSR Council of Ministers, the AUCCTU and the Komsomol Central Committee for the results of the 1982 all-union socialist competition.

The Institute of Microbiology imeni A. Kirkhenshteyn obtained significant results in research on the mutual relationships between viruses and cells using the methods of genetic engineering. Successes were achieved in developing the methods of diagnosis and immunological prevention of cattle leukosis. In the area of microbial synthesis of biologically active substances, strains of lysine and citric acid producers were improved. Possibilities were revealed for using new types of raw materials for biotechnological processing.

In the area of the theory of multicomputer systems, the Institute of Electronics and Computer Technology is working on the architecture of computer networks, and it is conducting a great effort to create and improve the Akademset experimental network of the USSR Academy of Sciences and the academies of sciences of the union republics. The general conception of using series YeS and SM computers in open computer networks was created, and it has now been approved by an intergovernmental commission for CEMA countries; the conception of creating local computer networks was created.

A method of producing lysine making it possible to raise the yield of this product by two and a half times, created by the Microbiology Institute, was introduced at several of the country's biochemical plants. A new biotechnological process of obtaining citric acid proposed at an experimental biochemical preparations plant increases its yield by 20-30 percent in comparison with the best world indicators. All Soviet production of citric acid by the surface method has been converted to this process; moreover it has become an object of several license agreements.

The Wood Chemistry Institute developed a method of producing nutrient yeast and molasses from mildly decomposed peat. This method is now being used on an experimental industrial scale. The same institute created a process of obtaining furfural providing for a 20-25 percent higher product yield than the most effective processes used abroad. This process was introduced at a number of the country's enterprises, and a license for its use has been sold as well.

Products worth about 150 million rubles were manufactured in 1981-1983 in the Ministry of Chemical Industry and the Ministry of Medical Industry on the basis of technological developments of the Institute of Organic Synthesis. Export of medical preparations produced by the institute's experimental plant is providing for significant currency income.

Jointly with several Baltic production enterprises the Physical Energy Institute has instituted an extensive program of introduction of new production processes and quality control methods pertaining to semiconductors and circuits.

The Latvian Academy of Sciences faces serious tasks in the future. Fundamental research on the basic directions determined by the profile of its institutes at a high theoretical level is required. At the same time the academy must form scientific-technical policy in the republic more actively and strive for further acceleration of scientific-technical progress and growth of the proportion of the accomplishments of science introduced into practice. With this purpose the large republic scientific research and experimental industrial complexes which have already been organized or which are presently undergoing formation must undergo accelerated development. This would consequently mean concentration of scientific forces and of material-technical support on solving the most important national economic problems.

Such for example is the task of creating the necessary assortment of resources for chemicalization of agriculture, and new medical preparations. A complex

consisting of academy institutes of organic synthesis, microbiology and biology, a number of the republic's VUZs and sector institutes and the Biolar Scientific-Production Association is evolving here. The complex will be completed with the erection of a biological testing center with a nursery for experimental animals. In this form it will possess unique possibilities, and it will produce considerable benefits.

There is one other scientific-technical complex that is intended for development of biotechnological processes. Its composition includes institutes of microbiology, organic synthesis, biology and wood chemistry, the academy's experimental plants, sector institutes and VUZs, the feed production complex at the Uzvara Kolchoz, an experimental biotechnological complex at the Ogre Sovkhoz and other institutions. An independent complex is evolving out of the Institute of Wood Chemistry, together with its special design bureau, and the Silava Scientific-Production Association; the task of these complexes--to create procedures for integrated processing of wood materials--is an extremely urgent one.

The academy institutes of polymer mechanics, inorganic chemistry, physics and physical energy are being brought together with VUZs and sector scientific research institutes of the corresponding profile and with several special design bureaus and experimental plants with the purpose of creating new materials. A complex for protection of metals against corrosion based on the Institute of Inorganic Chemistry, with which sector organizations will be associated, is also planned.

The last in this list but perhaps one of the first in significance is a complex for solving the problems of automation and wide use of computer technology based on the Institute of Electronics and Computer Technology.

The speaker went on to say that the problem of reinforcing the experimental base is extremely acute in our academy. Many assets have now been invested into it, and most institutes possess modern laboratory buildings. But construction of a number of facilities planned long ago is proceeding too slowly, and some construction has not even been started yet, even though the academy represents less than 1 percent of the total volume of capital construction in the republic's budget. Only in 1984 did the situation improve; for the moment, however, a number of scientific directions still lack a satisfactory experimental base.

having studied the status of the experimental base and having evaluated the real prospects of capital construction, the governing board of the Latvian SSR Academy of Sciences concluded that it would be suitable to create a central design and technological bureau outfitted with an experimental production operation under the Department of Physical Technical Sciences.

The question of more fully satisfying the orders of the Latvian SSR Academy of Sciences for instruments, production equipment and a number of materials, including ones purchased abroad, should apparently be examined more attentively as well, considering the currency income that the academy's developments provide.



Then reports and a draft decree on the work of scientific institutions of the Latvian SSR Academy of Sciences were discussed.

The activities of the Institute of Inorganic Chemistry were described by Academician M. M. Shults. This institute, which had as its director B. A. Purin until his election to the post of president of the Latvian SSR Academy of Sciences, has maintained ties with the Institute of Silicate Chemistry imeni I. V. Grebenshchikov of the USSR Academy of Sciences for a long time. The Institute of Inorganic Chemistry is one of the pioneers in the progressive direction of efforts to create raw materials for unoxidized ceramics. Methods have been developed for plasma-chemical synthesis of many components, and the institute has organized acquisition of such ceramics on an experimental industrial scale. However, these components are now being transferred to sector organizations for final acquisition of the ceramics themselves. Of course, they do communicate the results of their work to the institute, but obviously this procedure is significantly hindering further development of this important direction. The appropriate experimental base must be created at the institute itself.

In this connection, Shults continued, the relationships between academy and sector science need to be widened somewhat. It is time to think about developing premises that would regulate these relationships with some definiteness. Many academy scientific institutions, and particularly our Institute of Silicate Chemistry, are working on developments for sector institutes and for industry. Each year the institute completes several dozen such assignments. But for the most part this work is carried out by the efforts of the institute's principal employees, at the expense of the budget intended for fundamental research. This would be all right if a possibility exists for including applied work in a given integrated program for which the appropriate assets are allocated, but as a rule such programs are designed to last not less than a five-year plan. Academy institutes to which directive organs have assigned developments in the interest of industry must be supplied with the personnel, finances, experimental base and other support necessary for this. A special design and technological bureau would best be organized for academy institutes specializing in materials technology, as had been done in the Siberian Department of the USSR Academy of Sciences, in the Ukrainian SSR Academy of Sciences and in other academy centers.

Academician N. M. Zhavoronkov noted the successes of Latvian SSR institutes in creating new materials, and he offered support to the proposal for strengthening the experimental and production base of these efforts. The Latvian SSR Academy of Sciences is also developing a number of other important directions. The same Institute of Inorganic Chemistry obtained very interesting results in development of electrochemical membrane processes for separating and purifying liquid wastes. Highly promising research is also going on with the purpose of creating inhibitors of metal corrosion. The work of the Wood Chemistry Institute aimed at obtaining thermomechanically strengthened wooden articles is of considerable practical interest. Wood is nothing more than a natural compound material in which lignin is the matrix and cellulose fibers are the reinforcing component. The institute has discovered chemical methods for softening wood, after which the most



diverse articles can be obtained from it by hot rolling through rollers of the needed shape. Moreover the wood is strengthened by such rolling. This method is simple and inexpensive, since a finished article of the needed shape is obtained directly from the initial natural raw material, avoiding all stages of creating a compound material by thermochemical means. It is absolutely necessary to attract the attention of industry to these projects.

Academician G. K. Skryabin emphasized that the Latvian SSR Academy of Sciences occupies a leading place in the country not only in many directions of chemistry and fine chemical technology but also in a number of areas of technical microbiology. Mention can be made here of many good developments: production of nutrient protein (yeast), microbiological processing of plant vegetation, acquisition of biological gas, microbial synthesis of citric acid and so on. The work of microbiologists of the Latvian SSR Academy of Sciences is widely known, and it enjoys respect in all republics.

Giving a high evaluation to the activities of the scientific institutions of the Latvian SSR Academy of Sciences Academician A. A. Bayev named two interesting and practically important directions of its work, which in his opinion require intensive development. These directions include efforts to obtain and utilize biological gas, being carried on in the Institute of Microbiology imeni A. Kirkhenshteyn, and research concerned with diagnosis and treatment of cattle leukosis--a disease encountered both in the Baltic and in a number of other regions. Scientists of the Microbiology Institute and the Institute of Organic Synthesis have already moved rather far ahead in creating vaccines to prevent leukosis. Both directions are extremely promising, and they deserve special attention from the governing board of the Latvian SSR Academy of Sciences.

The decree of the Presidium of the USSR Academy of Sciences on the work of scientific institutions of the Latvian SSR Academy of Sciences mentioned the important results achieved by this academy in the area of fundamental research in a number of leading scientific directions, in solution of the important problems of the national economy's development and social and cultural development of the republic, and its significant contribution to hastening scientific-technical progress and assimilation of the accomplishments of science in production.

New materials of the most diverse purposes have been created and introduced into practice. Thus the Institute of Polymer Mechanics developed a foam polymer for thermal insulation with a higher capability for deformation at the temperature of liquid helium, polymer compounds to be used in instrument housings as a substitute of scarce and expensive titanium materials, filled modified thermosoftening plastic for hydraulic engineering construction and so on.

Plasma methods of obtaining new high-melting compounds (nitrides, carbonitrides, borides and so on) in the form of ultradispersed powder, developed by the Institute of Inorganic Chemistry, are being used successfully in a number of sectors of industry. Eighty of the country's enterprises are using ultrahard cutting tools created out of ultradispersed powders. The

republic has organized restoration of the parts of agricultural, road building and construction machines by the plasma spraying method.

Ultrapure diffusates for cleaning and protecting the surface of power diodes and transistors (Physical Energy Institute), arsenic chalcogenides to be used as optical recording materials, alloys obtained by the magnetohydrodynamic method (Physics Institute) and others were named among the new materials.

A method of processing plant vegetation and the wastes and byproducts of agriculture to obtain nutrient protein was proposed in support of the USSR Food Program. Biotechnical complexes containing biological gas production devices were built and are being improved at the Uzvara Kolkhoz and the Ogre Sovkhoz (Institute of Microbiology).

Most products manufactured by plants of the republic's Olaynfarm and Biolar associations are based on developments of the Institute of Organic Synthesis. The first industrial series of nine new drugs, including three enzymatic drugs, have been released. Nine other drugs to treat cardiovascular diseases, malignant tumors, leukosis and other diseases are still in the integrated testing stage. Highly complex peptide production procedures were assimilated for the first time in the USSR, the first lots of peptide preparations for medicine and agriculture were produced, and a procedure for producing synthetic prostaglandin was created.

In the area of automation of scientific research, much attention is being devoted to developing and introducing specialized automated devices utilizing minicomputers. An experimental time-sharing computer network combining four YeS computers and 16 SM computers was created. A number of projects having fundamental significance to creation of a computer network in the USSR were completed (Institute of Electronics and Computer Technology). Experimental operation of the Priznak system for automated retrieval and selection of characteristics and prediction of biological activity of chemical compounds was developed, and its experimental operation was begun (Institute of Organic Synthesis). Instruments and systems for automating research were created in a number of institutes.

It would be suitable to strengthen ties of academy institutes with departments of the USSR Academy of Sciences, with the academies of sciences of other Baltic republics and with ministries and departments of the Latvian SSR. Preparation of proposals by the academy for utilizing the results of completed projects having important national economic significance must be activated, so that these proposals could be considered when the state plan for the USSR's economic and social development is drafted.

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11004

CSO: 1841/80

## PIPELINE STRESSES. RELIABILITY ASPECTS

Moscow KHIMIYA I ZHIZN in Russian No 9, Sep 85, pp 12-15

[Engineer V.Kh. Galyuk, Doctor of Technical Sciences A.P. Gusenkov, and Candidate of Technical Sciences M.F. Fokin: "Pipeline Reliability"]

[Excerpts] Pipeline transport of liquid and gas products is very economical. Today the length of main pipelines in our country is more than 200,000 kilometers and continues to grow at extremely rapid rates. Transport arteries fitted out with the most modern technology, such as the transcontinental gas line stretching about 4,000 kilometers from Urengoy to Pomary to Uzhgorod, or the Surgut-Polotsk oil pipeline, are truly becoming the blood-carrying arteries of the entire economy. Soon the network of pipeline transport will include lines for conveying not only liquids and gases but also solid materials--coal lines and container lines.

Of course, with the growth and development of this network, the problem of its reliability becomes more and more important, especially according to criteria of the mechanical strength of the line part of the pipe, or, more simply speaking, the steel tube itself, through which the oil, gas, coal, and other products flow. After all damage to the pipeline frequently leads to very serious consequences: pollution of the environment, or breakdowns in the work of enterprises which extract and process mineral and organic raw materials.

The reliability of a main pipeline is established as early as during design, when the designer decides, in particular, what kind of pipes (seamless hot-rolled ones, or welded straight-seam ones, or spiral seam, or multiple-ply ones) will be used in the future pipeline. At current scales of construction of oil and gas mainlines, this choice largely depends not only on the strength of the structures but also on how economical they are. Currently the most widespread are welded pipes made from low-alloy steel. They are formed from rolled steel, then welded together with longitudinal or spiral seams.

Currently, in designing main pipelines, the nature of the products which will be flowing through the tubes are practically not taken into account at all. But it does make a difference. In gas lines, because of the expandable properties of compressed gas, a sudden increase in pressure can cause cumulative damage to the pipes for a length of several hundred meters. In oil pipelines and pipelines for other products this danger does not exist: liquids are incompressible, and after a break in the pipe the pressure falls rapidly, and the crack in the metal stops growing.

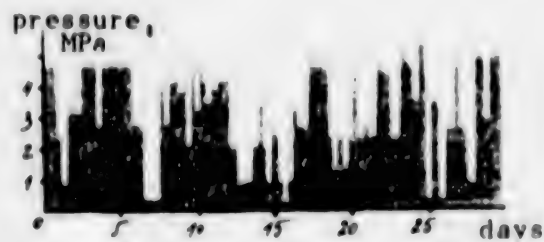


Fig. 1. Diagram of the pressure on one of the sections from the Gorkiy-Yaroslavl oil pipeline in June 1980.

On the other hand, gas and liquid affect the pipe differently under conditions of conventional, normal operation. Even during gross deviation of the gas-pumping units, the pressure in the main gas pipeline remains substantially unchanged, staying close to the statistical, working pressure, because of the duration of decompression of gaseous products. It is another picture entirely in oil pipelines: the pressure changes sharply for even a short-lived deviation of the pumps. Changed conditions of extracting and pumping oil, the erosion of protective blocks--all of this has an impact on the cyclic nature of the loads which the pipes will experience, and the diagram of pressure in an oil pipeline will usually resemble a toothed saw. For 20-30 years of use an oil pipeline experiences several thousand cycles of increased and decreased internal pressure--with various frequencies and amplitudes. During this time, there is a high probability of destruction of the pipe because of elastic cyclic deformations in zones where pressure is concentrated. What is known as small-cycle fatigue of the material comes about.

An oil pipeline which experiences a changed load is under the same conditions as a wire which is bent back and forth many times. If you bend and unbend the wire one time, it will not break, although the deformations are very great--more than simple flexes. If you do it several dozen times, the wire breaks, we can use this when wirecutters are not handy. With a single, even negligible deformation, damage occurs in the crystal lattice of the metal, it accumulates with repeated deformations, and finally the process leads to destruction--small-cycle destruction, because as a rule many thousands or even tens of thousands of cycles are not enough to do this.

The possibility of small-cycle destruction of pipes, T-joints, and other elements of the linear part of the main pipeline has been confirmed experimentally. These experiments, naturally, are incomparably more labor-intensive than conventional tests for statistical strength, and sometimes take up many weeks and months.

Tubes and T-joints of various constructions were covered over with tensometers--up to 200 for every element tested. Then pressure was applied which changed over the course of tests in a manner similar to the way it changes in an actual operating oil pipeline. An automatic recording system continuously received signals from the tensometers, and recorded the tensions and deformations in the walls of the pipe. The concentrations of pressures in the



defects of the welded seam (imperfectly welded sections, misaligned edges, angularities, and so forth) can be detected not only by the instruments' indications, but even visually. In order to do this, models of welded connections were constructed out of special plastic whose transparency in polarized light changes with an increase in internal pressures.

It turns out, that during pressure oscillations the tensions in the defects of the welded seam are 2-3, sometimes even 7-8 times higher than the average (nominal) in the smooth part of the pipe. It is not surprising that small-cycle destruction in the defects begins after  $10^3$ - $10^4$  cycles of changed load, long before expiration of the estimated operating life of the oil pipeline.

All the factors which cause small-cycle fatigue--the number and distribution of defects, the amplitude and frequency of changed pressure, the degree of concentration of tensions--have an accidental nature. And precise prediction of when one section or another of the oil pipeline will be destroyed is, unfortunately, impossible. But the probability of this can be estimated. For example, the probability of small-cycle destruction of the pipe in the oil pipeline in the European part of our country under current operating conditions is estimated at  $5 \times 10^{-8}$  for the first 10 years of operation,  $4 \times 10^{-6}$  for 20 years, and  $10^{-5}$  for 30 years. This probability is still higher for Siberian oil pipelines, in which the cyclicity of the load is much greater.

A sharp reduction in small-cycle tensions on oil pipelines is hardly to be expected in the near future, although much is already being done for this. Thanks to increased reliability of the technological equipment during the last 5-7 years, the cyclicity of the load of mainlines in the system of the Main Administration for Transporting Oil has been reduced by a factor of 1.5-2. But this, unfortunately, is not enough.

How about fighting against small-cycle fatigue today? And is such a fight possible at all?

It is possible. But it requires a whole set of measures. First of all, pipe plants must be stricter about the quality of pipes. In particular, pipes with a high concentration of tensions (such tubes, according to preliminary estimates, amount to about 0.1 percent) can already be rejected today. Of course, no one is saying they should be thrown away. They are quite suitable for constructing many less important structures, but not for oil mainlines.

What else can be done? Methods of design must be perfected, for the reliability of any machine, any construction, as they say, rests at the end of the designers' pencil. Worn-out elements of existing oil pipelines must be found and replaced with new ones in a timely fashion, periodic testing of mainlines under increased pressure should be done, and oil pipeline operating services must be fitted out with modern devices for locating defects, both stationary ones and ones which move through the pipe along with the liquid--such things already exist.

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## TECHNICAL AND COST EFFECTIVENESS ANALYSIS OF CHEMICAL RECYCLING PROCESSES IN ISOPRENE PRODUCTION

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 9, 1985 pp 520-522

KALYAGIN, Yu.A., SADCHIKOV, I.A. and TSURKIN, Ye.B.

[Abstract] Technical and cost effectiveness factors were analyzed for isoprene production in terms of using chemical recycling technology. Both the advantages and disadvantages applicable to the production of isoprene from isobutylene and formaldehyde via dimethyldioxane are discussed, including the requirements of new equipment for implementation of a recycling scheme. Among the major advantages is more efficient utilization of raw resources and less waste production, and their attendant expenses. Tabular data on cost effectiveness of individual operations demonstrate that, despite the additional expenditures as a result of the new technology, the net effect is one of considerable financial advantages from recycling technology. References 5 (Russian).

[133-12172/12379]

## REDUCTION OF BARYTIC CONCENTRATE BY PETROLEUM COKE IN BARIUM NITRATE PRODUCTION

Kiev KHIMICHESKAYA TEKHOLOGIYA in Russian No 5, Sep-Oct 85 (manuscript received 7 Sep 84) pp 32-33

ANNOPOLSKIY, V.F., GITIS, E.B., ALEKSEYEV, V.I., STRIGUNOV, F.I. and MAZUR, V.S., Kharkov "Karbonat" Scientific Production Association

[Abstract] Trials were conducted with the use of petroleum coke as a substitute for furnace coke in the production of barium nitrate from barytic concentrates. Statistical comparison of the results obtained with both types of coke demonstrated that the optimal firing conditions for reduction of the concentrate required a 6:1 ratio of concentrate to petroleum coke, and a firing time of 80 min at 1150°C. With the use of the less expensive petroleum coke the fraction of BaS in the melt was some 3% higher than with furnace coke, with 98.5-99.5% reduction of the barytic concentrates. References 4 (Russian).

[135-12172/12379]

## COAL GASIFICATION

### ADHESIVE FOR COAL

Moscow TEKNIKA I NAUKA in Russian No 8, 1985 p 12

LORIN, Ye. and MURAVYEV, E.

[Abstract] A technique for endowing carbamide compounds with plasticity and foaming properties has been developed. The plasticizer used is identified by the acronym PVAD, of which one of the components is dibutylphthalate. The virtues of this plasticizer are its chemical neutrality, the stability of its properties during storage, low volatility, and the ability to combine with carbamide resins (urea resins) in any proportion. The "foaming agent" is polyisocyanate, which can be introduced into resins using conventional mixing techniques. The active isocyanate groups react with the water in the resin, causing a release of carbon dioxide, most of which remains in the resin and makes it foam. The technology for using these compounds to reinforce rock has also been developed and includes the equipment for injecting the compounds into a massif, the drilling and spacing parameters for the drillholes, and the duration of the operating cycles. The new technology has been introduced at the Pechora, Kuznetsk, Karaganda, and Donetsk coalfields and has led to expenditures reduced by a factor of 1.13 to 1.96 and annual savings of 30 to 62 thousand rubles per stope. Figures 1; references 0.

[93-13050/12379]

UDC 66.096.5.015.24:541.12.034

### HEAT EXCHANGE BETWEEN FLUIDIZED BEDS AND SURFACE UNDER HIGH PRESSURES

Kiev KHIMICHESKAYA TEKHOLOGIYA in Russian No 5, Sep-Oct 85 (manuscript received 10 Jun 85) pp 41-44

BORODULYA, V.A. and PODBEREZSKIY, A.I., Institute of Heat and Mass Exchange, Belorussian SSR Academy of Sciences, Minsk

[Abstract] Mathematical analysis was conducted on the effects of heat exchange between fluidized beds of glass, chamotte, quartz, etc., surfaces, as a method of using fluidized beds for efficient combustion of solid fuel materials. Analysis of heat exchange for various coals in relation to surface and coal

particle size also demonstrated that pressure up to 8.1 MPa could be used to regulate heat transfer, with the effects of pressure becoming more pronounced as the particle size increases. The effects were apparently due to changes in the mechanism of heat exchange between the fluidized bed and the surface, leading to a greater convective component as a result of greater density of the fluidized gas and a decrease in kinematic viscosity. With an increase in the particle size, the convection component shows a proportional increase due to increased velocity of gas filtration into the crevices in the particles and among the particles. Figures 5; references 6: 5 Russian, 1 Western.  
[135-12172/12379]

UDC 542.97:661.66

#### CATALYTIC EFFECTS OF GASEOUS METAL CARBIDES ON VAPORIZATION OXIDATION AND GRAPHITIZATION OF CARBON MATERIALS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 283, No 6, 1985 (manuscript received 9 Oct 84) pp 1415-1417

LVOV, B.V., Leningrad Polytechnic Institute imeni M.I. Kalinin

[Abstract] The formation of gaseous metal carbides was studied as a mechanism responsible for catalytic vaporization, oxidation and graphitization of carbon materials. The action mechanisms were applied to published data on vaporization of coal in presence of solid  $B_4C$ , analysis of the catalytic effects of Pb on oxidation of graphite tables by oxygen, and to an analysis of coke graphitization in the presence of  $ZrC$ . The gaseous carbide mechanism would account for the catalytic effects on the basis of gasification of carbon to form  $MeC_n$  molecules with metal vapors--largely the species  $MeC$ ,  $MeC_2$  and  $MeC_4$ . The  $MeC_n$  molecules then resolve into a condensation phase of solid or liquid carbides and pyrolytic carbon. These products settle on the target material to provide catalytic sites. The carbide melts provide better contacts among the reactive components and promote carbon gasification, with attendant increase in oxidation and graphitization. References 14: 12 Russian, 2 Western.  
[58-12172/12379]

INVESTIGATION OF THERMAL DESTRUCTION OF PHOSPHORYLATED CELLULOSES

Riga KHIMIYA DREVESINY in Russian No 5, Sep-Oct 85 (manuscript received 14 May 84) pp 34-37

RYAZNTSEV, Ye.N., PONOMAREV, D.A., LUKASHENKO, I.M. and KALINKEVICH, G.A., Leningrad Forest Technology Academy imeni S.M. Kirov

[Abstract] Pyrolytic mass-spectrometry was used to study behavior of cellulose during thermal destruction. The test samples were heated at a rate of  $10^{\circ}\text{C}/\text{min}$  in temperature interval of 40 to  $910^{\circ}\text{C}$ , under  $10^{-2}$  to  $10^{-3}$  mm Hg vacuum. Beech cellulose samples were studied: 1) control, 2) sample treated with dimethylphosphite (7.2%), 3) treated with phosphorus chloroxide (2.9%) and 4) sample treated with diethyl ester of 2,3-epoxypropylphosphonic acid (3.3%).  $\text{CH}_4$ ,  $\text{H}_2\text{O}$ ,  $\text{CO}$  and  $\text{CO}_2$ , phenol and aromatic hydrocarbons were identified as pyrolytic products. Addition of phosphorus-containing compounds to cellulose shifted the maximum of gas evolution by  $60\text{--}120^{\circ}\text{C}$  towards lower temperature. The yield of solid residue increased at  $550^{\circ}\text{C}$ , while the dehydration process intensified; the amount of evolved gases decreased. Temperatures about  $750\text{--}800^{\circ}\text{C}$  led to formation of non-volatile polycyclic aromatic structures. Figure 1; references 7: 5 Russian, 2 Western.  
[136-7813/12379]

## ELECTROCHEMISTRY

UDC 669.38:621.3.049

### IMPROVED ELECTROLYTE FOR COPPER-PLATING PRINTING PLATES

Kiev *TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA* in Russian No 3, 1985, p 33

POLYAK, Yu.V., IGNATENKO, Ye.Kh., engineer, NECHAY, M.V., candidate of technical sciences

[Abstract] An improved sulfuric acid electrolyte to be used for copper plating has high scattering power and ensures production of fine-crystalline plastic and lustrous coatings. Composition of the electrolyte is given. The electrolyte can be used for industrial production of high-quality coatings which meet the most rigid requirements for heat resistance and heat impact. Use of the electrolyte makes it possible to reduce the time required to copper-plate printing plates from 40 minutes to 20 minutes and to increase throughput of the equipment 2-fold. Introduction of the electrolyte at the Industrial Association imeni S.P. Korolev produced an economic impact of more than 20,000 rubles.

[70-2791/12379]

UDC 541.138

### KINETICS AND MECHANISM OF ELECTROCHEMICAL FORMATION OF POROUS SURFACE LAYER ON SILICON IN HYDROFLUORIC ACID. DISTINGUISHING CHARACTERISTICS OF ELECTROCHEMICAL BEHAVIOR OF n- AND p-TYPE SILICONS DURING THE FORMATION OF A POROUS LAYER

Moscow *ELEKTROKHIMIYA* in Russian Vol 21, No 9, 1985 (manuscript received 20 July 83) pp 1172-1179

IZIDINOV, S.O., BLOKHINA, A.P., and MARTYNOVA, T.S., All-Union Electrical Chemistry imeni V.I. Lenin, Moscow

[Abstract] The results of investigating the principles underlying the electrochemical behavior of silicon during galvanostatic and potentiostatic polarization in solutions of HF were discussed. Readings were taken on electrode chips made from n- and p-type silicon 0.3 to 1 mm thick ( $\rho = 0.01-10 \text{ ohm}\cdot\text{cm}$ ) and on hard



disks utilizing polyethylene cells. The light source was a 500 to 1000-watt film projector lamp. The anode polarization curves constructed for the two types of silicon showed that the type of conductance had a strong influence on their electrochemical behavior. These curves also revealed that the electrochemical behavior of the silicons was determined solely by the formation of the porous layer. The p-type silicon exhibited a stable relationship between current and potential, whereas the n-type current showed distinct changes in potential as a result of the formation of the porous layer. With the p-type silicon, the possible growth in potential was compensated by the continuous formation of a well-developed system of micropores. With the n-type silicon, passivation of the surface resulted from the formation of undissolved silicon oxidation products which acted as a dielectric barrier between the porous layer and the electrolyte. This passivation was temporary and was followed by current values equal to those existing prior to passivation. The concentration of n-type impurities strongly affected the results. Polarization capacity decreased as their concentration increased. The concentration of the hydrofluoric solution also had a substantial influence on the results of the investigation. Figures 7; references 13: 7 Russian and 6 Western.  
[101-13050/12379]

UDC 541.138.3:621.357.6

#### SPHERULITES AS FORM OF ELECTROLYTIC DEPOSIT GROWTH

Moscow ELEKTROKHIMIYA in Russian Vol 21, No 9, 1985 (manuscript received 27 April 1984) pp 1211-1214

MAMONTOV, Ye.A., KURBATOVA, L.A., and VOLENKO, A.P., Ulyanov Polytechnic Institute

[Abstract] The structure of the cathode layers of nickel, cobalt, cadmium and zinc was studied to see whether it contained spherulites. The structure was formed next to an indifferent sublayer of stainless steel during the initial stages of electrocrystallization. Layers of these metals 10-100 nm thick were examined under a transmission electron microscope. Just like copper, the layers of nickel and cobalt consisted of an accumulation of properly or somewhat improperly formed spherulites very similar in shape to copper spherulites. The nickel and cobalt spherulites were approximately one order of magnitude smaller than copper spherulites. Higher overvoltage was cited as the cause of smaller nickel and cobalt spherulites. The greater the current density, the smaller the size of the spherulites obtained. Two types of spherulites were obtained from the electrocrystallization of cobalt, depending on the pH level. It was concluded that the mechanism of spherulite formation is very similar for copper, nickel and cobalt. This was not the case with zinc and cadmium. No spherulites were observed with these metals, regardless of the conditions of electrolysis. Spherulite formation during electrocrystallization is evidently not characteristic of these metals. Figures 2; references 8: 5 Russian and 3 Western.  
[101-13050/12379]

## MEASUREMENT OF ELECTRICAL PROPERTIES OF SUPERTHIN POLYMER FILMS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 283, No 6, 1985 (manuscript received 2 Oct 84) pp 1404-1408

YENIKOLOPYAN, N.S., academician, GRUZDEVA, S.G., GALASHINA, N.M., SHKLYAROVA, Ye.I. and GRIGOROV, L.N., Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] In view of recent reports that dielectric polymers become conductors under suprathreshold pressures ( $P_0 = \text{ca. } 10^3 \text{ MPa}$ ), microelectrode studies were conducted on polypropylene films laminated on copper plates to determine whether such superthin films can conduct electricity under low pressures. Measurements with the indium-tipped steel electrodes demonstrated a specific resistance on the order of  $10^{-2} \text{ ohm}\cdot\text{m}$  under a pressure of 4.5 MPa for 90 nm thick film. This value is characteristic of semiconductor materials and is smaller by 16 orders of magnitude than the specific resistance of thick polypropylene films under normal pressure. This apparent conductivity of very thin polypropylene films cannot be attributed to classical tunnel mechanism found in films that are thinner than 3 nm; thus, the mechanism for this unexpected phenomenon remains to be clarified. Figures 4; references 9 (Russian).

[58-12172/12379]

SUSCEPTIBILITY OF COMPOUNDS WITH HIGH NITROGEN CONTENT TO SELF-PROPAGATING THERMOLYSIS

Minsk DOKLADY AKADEMII NAUK BSSR in Russian Vol 29, No 9, 1985 (manuscript received 25 Oct 84) pp 824-827

LESNIKOVICH, A.I.; SVIRIDOV, V.V., Corresponding Member of BSSR Academy of Sciences; GAPONIK, P.N., KARAVAY, V.P., TSELOVALNIKOVA, G.M., DEGTYARIK, M.M. and VYAZOVKIN, S.V., Belorussian State University imeni V.I. Lenin; Scientific Research Institute of Physical/Chemical Problems, Belorussian State University imeni V.I. Lenin

[Abstract] Self-propagating high-temperature decomposition [SHD] is characterized by the absence of substantial gas-phase reactions and of dispersion of the initial substance, and also by the formation of gaseous products. Tetrazole and 13 of its derivatives, including some unique new derivatives, were tested for their SHD capability. Cylindrical samples with a diameter of 10 and a length of 10-15 mm were prepared by pressing from powder and ignited by flame or by a nichrome spiral in air or argon at atmospheric pressure. In some cases, a burning rate was higher in air when gases formed by the SHD also ignited, but these flames were easily blown out by the continuing gas evolution and then the burning rates were identical to those in argon. The nature and location of a substituting group on the tetrazole ring had a considerable effect on its decomposition. Some derivatives (such as 5-amino-1-vinyltetrazole) decomposed by SHD with the production of a melt which later formed a porous residue; others (such as poly-5-vinyltetrazole) acted analogously but without producing a melt. The cupric salt of this compound burned particularly rapidly. In all cases, either a melt or residue was formed at the surface and appeared to be necessary to sustain SHD. This same effect was noted with hexachloromelamine, which burns by SHD only so long as the residue is not allowed to fall completely from the sample. Apparently the melt or residue acts to reduce heat loss and its presence is necessary for substances in which SHD proceeds at a relatively slow rate. The varying results observed underline the difficulty of forming clearly defined categories for complex processes. References 13: 10 Russian, 3 Western. [100-12672/12379]

## FERTILIZERS

UDC 661.424.6.065.5

### DEVELOPMENT AND INTRODUCTION OF TECHNOLOGY FOR PRODUCTION OF GRANULATED AND LARGE-CRYSTAL POTASSIUM FERTILIZERS

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 9, 1985 pp 536-540

SOKOLOV, I.D., SEBALLO, V.A. and STRUZHKO, V.N.

[Abstract] An analysis was conducted on the various operational processes underlying the production of granulated and large-crystal potassium fertilizers, in view of the fact that the USSR Food Program anticipates that only such forms shall be supplied to Soviet agriculture in the period 1988-1990. Mathematical analysis of the respective processes is discussed, and supplemented with schematic presentations of installations used in each operation. On the basis of such analytical data and the availability of raw materials, pilot and industrial plants were designed to fit the conditions prevailing in the USSR and the need for high-quality granulated and large-crystal potassium fertilizers. Figures 3; references 23 (Russian). [133-12172/12379]

UDC 661.717.5.023

### PREPARATION OF CARBAMIDE SUPPLEMENTED WITH NITRIFICATION INHIBITOR 4-AMINO-1,2,4-TRIAZOLE

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 9, 1985 pp 540-543

MIKHAYLOV, Yu.I., VODOPYANOV, V.G., IVANOV, M.G., MUSHKIN, Yu.I., BURMISTROV, V.N., BLYUM, B.G., VYVOLOKINA, A.G., YASHIN, N.N., STRAKHOVA, I.Ya. and MEZHUNOVA, N.P.

[Abstract] In order to diminish nitrogen loss from fertilizers, the process developed by the Japanese firm Ishihara Industries for the introduction of a nitrification inhibitor into carbamide was tested under pilot conditions. The inhibitor, 4-amino-1,2,4-triazole, was introduced in concentrations of 0.5, 1.0 and 2.0%, with the final product tested for durability, density and rest angles of the granulated carbamide. The resultant findings are summarized in tabular

form, and indicate that on addition of 4-amino-1,2,4-triazole the firmness of the granules as well as their density and rest angle diminish in comparison with the unsupplemented fertilizer. The optimal time for the addition of the triazole into the carbamide solution was at the second evaporation stage. Figures 3; references 7: 3 Russian, 4 Western.  
[133-12172/12379]

UDC 622.765.06

#### ENHANCED RECOVERY OF KCl IN POTASSIUM ORE ENRICHMENT

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 9, 1985 pp 545-547

ALEKSANDROVICH, Kh.M.

[Abstract] A detailed analysis was conducted on flotation processes employed in KCl recovery from potassium ores, in order to further improve the present technique which utilizes polyacrylamide and demands high volumes of depressants and collectors. One of the most promising approaches to date appears to be the use of cation-active depressants. In distinction to sodium carboxymethyl cellulose or octadecylamines, the cation-active depressants compensate for the negative charges on clayey substances and their activity remains relatively constant over a wide range of reagents. Such agents made it possible to reduce the use of polyethyleneimine 2- to 3-fold, while increasing the recovery of KCl 2-3%. Among the most effective cation-active surfactants are those in the alkylpyridinium chloride series. References 9 (Russian).  
[133-12172/12379]

UDC 622.765.06:631.851

#### PILOT PLANT FLOTATION STUDIES ON PHOSPHATE-SILICEOUS DZHANATAS SLATE DEPOSITS

Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 9, 1985 pp 547-549

LYUSHNYA, L.M., KIRIKILITSA, S.I., STEFANOVSKAYA, L.K., SANDT, F.F., ANIPKINA, M.P. and MITSIKH, Z.U.

[Abstract] Pilot plant flotation studies were conducted on the recovery of  $P_2O_5$  from phosphate-siliceous slates of the Dzhhanatas deposits in the Karatau basin. Using technology relying on tallactam, IMR-25, and flotol 7.9 as collecting agents, conditions are described which ensure acceptable recovery of phosphorus (V) oxide, along with schematic presentations of the operational steps. The technique selected allowed for flotation of finely ground ores without preliminary sludge removal, yielding concentrates containing 24.7-26.1%  $P_2O_5$  vs. 17-19% in the starting material. This level of enrichment represents an 81-91% recovery. Figures 3.  
[133-12172/12379]



## PRODUCTION TECHNOLOGY OF GRANULATED CALCIUM FERTILIZER

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 5, Sep-Oct 85 (manuscript received 20 Aug 84) pp 15-16

KOSYAKOV, N.Ye., SERGIYENKO, I.D., POYARKOVA, I.F., ZHOLUDEV, A.I. and KODAK, N.L., State Scientific Research and Planning Institute of the Nitrogen Industry, Dneprodzerzhinsk Branch

[Abstract] Pilot studies were conducted on the production of granulated calcium fertilizer from various raw materials, such as phosphates, apatite and saltpeter obtained from various deposits. The basic studies concerned production with the calcium fertilizer enriched with various additives and supplements intended to enrich the commercial value of the product, including carbamide, ammonia nitrate, phosphoric acid, and polyacrylamide. In the process, calcium nitrate tetrahydrate, obtained from nitric acid treatment of phosphates, was washed with 58% nitric acid and transferred to a melting chamber. The melt was neutralized to pH 5.5-6.5 and concentrated by evaporation. The concentrate, containing 20-25% water, was then granulated in a drum-type dryer and granulator. The final product was found to retain its granularity (35.5-38.3% 2-3 mm) for 12 months. Figures 1; references 3 (Russian).

[135-12172/12379]

UDC 661.521

## PRODUCTION OF AMMONIUM CHLORIDE AT INSTALLATIONS PRODUCING CHLORINE-FREE NPK FERTILIZERS

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 5, Sep-Oct 85 (manuscript received 13 Jun 84) pp 19-21

MULYARCHUK, I.F. and GUMEN, V.I., Kiev State University

[Abstract] One of the more difficult steps in the production of ammonium chloride at plants producing chlorine-free NPK fertilizers involves sublimation of ammonium chloride following conversion of ammonium sulfate by potassium chloride. Successful sublimation was attained by using cooled (jacketed) sublimation columns, into which ammonium chloride vapors were forced by thermal pressure. The columns were fitted with rotating scraping elements to remove the deposited ammonium chloride from the walls of the column. With starting material derived from various sources of sublimation at 350-500°C sublimes were obtained that contained 97-98.5% ammonium chloride. The entire process can be simplified to the basic steps of pulp conversion and drying, distillation and sublimation of the ammonium chloride. References 5:

4 Russian, 1 Western.

[135-12172/12379]

## IMPROVED CRYSTALLIZATION BY EVAPORATION OF SCHOENITE LIQUORS IN CHLORINE-FREE POTASSIUM FERTILIZER PRODUCTION FROM MULTIMINERAL ORES

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 5, Sep-Oct 85 (manuscript received 14 Oct 84) pp 21-23

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[Abstract] Equilibrium-phase analysis was applied to secure optimal conditions for crystallization of K-Mg salts from Schoenite liquors obtained from multimineral ores used in the production of chlorine-free K fertilizers. Phase-equilibrium diagrams are depicted for Na, K, Mg//SO<sub>4</sub> and Cl-H<sub>2</sub>O systems constructed on the basis of the translation method for the regions of crystallization of K-Mg salts. These diagrams demonstrate that various approaches can be taken for crystallization by concentration, depending on the composition of the starting solutions. Optimal crystallization conditions are those that yield maximal precipitation of sulfate salts of K and Mg that can be harvested by filtration, and resemble double K-Mg salts in the form of kainite and carnallite. Such crystals are of a size sufficient to be retained by filters and their formation can be achieved when the solution contains high levels of magnesium chloride. Adherence to the suggested technology increases the yield of K-Mg sulfates two- to three-fold and significantly reduces losses of the sulfate ion in the form of gypsum. Figures 1; references 20 (Russian). [135-12172/12379]

## FOOD TECHNOLOGY

### BETTER REFRIGERATION NEEDED TO REDUCE FOOD INDUSTRY WASTE

Moscow KHIMIYA I ZHIZN in Russian No 9, Sep 85 pp 2-7

[Article by Dr of Technical Sciences A. M. Brazhnikov and Dr of Technical Sciences E. I. Kaukhcheshvili: "Waste-Free Agriculture Industry"]

[Excerpts] According to the data of the International Institute of Cold, annual losses of food products range from 20 to 30 percent. Converted into absolute figures, this is equal to about 1 billion tons per year. That is for the planet as a whole. And in our country? The percentage of losses is approximately the same figure, but in certain cases even higher. Consider this: from every ton harvested by far from easy labor we simply lose 300 kilograms. And this mainly consists of vegetables, fruit, and berries--the green constituent of our ration, a basic source of vitamins, which we need no less than proteins or carbohydrates. Why are the losses so high?

The main reason is the shortage of cold, refrigeration capacity for products of plant origin. There is still inadequate coordination in the work of all links of the refrigeration chain.

Products of livestock breeding are provided along their entire path with a genuine, reliable refrigeration chain. They are stored for longer than plants and transported farther, but the losses do not exceed a few percent. Why is it impossible to deal with plant products in the same intelligent and careful manner?

The actual yield of succulent plant products\* (according to the data of statistical administrations) in our country is more than 20 million tons, but the total refrigeration capacity is no more than 2 million tons. The refrigerators with a capacity of 500-1,000 tons (instead of 20,000-50,000 tons) which certain fruit and vegetable farms have are something like a single lifesaver on a ship. Refrigerated transport for plant products is chronically in short supply. As a result, most vegetables and fruits go not into refrigerators but into temporary storehouses or vegetable yards, where the losses can be even higher than 30 percent.

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\* Grains are not considered succulent plant products.

## The Refrigerator Is Not a Hospital

Let us go to the sovkhos, where the harvest of apples or plums, apricots, or tomatoes has already ripened. The fruits have been gathered, but they are still on the field. In bins or containers. Under the sun or under the rain--after all the harvest is collected in any sort of weather....

Specialists know that an apple must be cooled to a temperature of 2-4 degrees C no later than an hour after it has been taken from the branch. Each additional hour reduces the possible storage time of the apple by several weeks. The equation is still more inflexible for other fruits, to say nothing of berries. That is why today a main concern of fruit and vegetable farms is to collect the harvest and get rid of it in as brief a time as possible, to turn it over to whoever will take it, and as quickly as possible. And only after unloading the fruits and thus transferring the concern to whoever has accepted the produce is it possible to relax: the deed is done, the plan target is met.

What happens with the harvest afterwards? A conventional truck takes our boxes and containers to the storage refrigerator (we already know that for fruits the chance of getting there is no more than 1 in 10) or to the rayon base. And how long a wait is it? The driver has solid experience: if you drive up, then it will be until night, or rather--sometimes even until morning. We can wait, but as for the fruits....

Finally the produce has been accepted.

After sorting (unfortunately, by hand: it is not so simple to create an automatic machine which can tell the difference, for example, between a stale tomato and a fresh one!), the boxes are transferred into refrigeration chambers. But in season, fruits flow in in a great stream, so they are far from always sorted--there are not enough hands, and frequently they go directly from the truck into the refrigeration areas. In the order in which they were received, naturally. Taking into account the refrigeration capacity, naturally. While there is still space free, naturally.

Let us go into the refrigeration chamber. The transported containers are standing here. The produce is cold. Everything is cold. And if the fruits have not been sorted? A first-class apple is right next to a rotten one, and then, before anything further is done, they will both be rejected and tossed into the category of wastes.

The staff of the refrigerator wagons onto which our boxes were loaded brings them from the storage refrigerator to a distributing refrigerator. It is cold in the cars, the temperature should be kept between +2 and +8 degrees. It should be, but that doesn't mean that is what happens. It is the end of summer, it is hot, the path is long, and if the refrigerating equipment requires attention who is going to adjust it on the road? When the staff unloads the produce, a certain amount again has to be rejected at the city refrigerator. And stores too sort through the produce.

Cool? No--Freezing!

Today, as in past times, produce is stored in a slightly cooled condition. The maximum amount of time that can be spent in a refrigeration chamber is several weeks. And interseason storage is simply unheard of. The exceptions are apples and pears of two or three varieties which can be stored several months in a strictly regulated temperature regime (in refrigerators of the latest construction, where the variation of temperature is no more than 2 degrees) or using a regulated gas environment.

The expression "may be stored" here means only that it is possible to reduce the outside changes to a minimum. Under these conditions, biological processes lead to a stage where after 2-3 months the nutritive value of the fruits declines substantially. The concentration of vitamins, for example, is cut in half, sometimes even to a third. So only a small part of the harvest can be stored in a cooled state. And how is the rest to be stored? How are you supposed to get produce for the rest of the year?

Storage in a frozen state, at -18 degrees C and below, will help resolve these problems. At such temperatures, most of the moisture is crystallized, so undesirable changes in the produce are reduced to practically nothing. It is not worthwhile to eliminate refrigerators with plus temperature: it is unthinkable to freeze fruit if it will be on the table within a week. But when the idea is long-term, interseasonal storage, then nothing beats deep freezing. There are no alternatives.

Freezing fruits and vegetables is a delicate process, requiring precise following of the technological procedure. The distrust of frozen berries and vegetables came about as a result of uneducated use of this method, using it without taking into account the requirements of modern technology. In fact, let's say we have frozen a box of peaches. The box as a whole. The soft, succulent fruits, naturally, have frozen into a single block. It can be stored, and it is easily transported, but that is how it gets to the store. The result: the peaches have either thawed and turned into pulp or are still frozen and must be chipped apart. In any case, the fruits are in such a form that they clearly do not arouse any desire to buy them, unless for a compote or jam. This sort of storage does little for the consumer, moreover the method is a compromise. Produce stored in this fashion should go only for industrial processing. What is the solution? Switching over to a technology of rapid, particularly rapid freezing, which will make it possible to obtain high-quality produce which retains practically all its original properties.

Rapid freezing is for us a new form of processing and storing any goods, especially produce. The products are rapidly cooled, in scant minutes, and frozen in special facilities with a temperature of about -50 degrees C. Freezing large fruits (melon or squash, for example) whole is out of the question: the cold penetrates inside them too slowly, the rate of cooling of the inside layers is not adequate for truly rapid freezing. So only cut-up pieces of fruit and vegetables are put into the facility. Berries and small fruits are frozen whole and are packaged in small portions, 500-800 grams. Such produce is stored and transported exclusively in the frozen state, at temperatures no higher than -18 to -20 degrees C, and is thawed only once--at home, directly in front of the consumer, in a microwave oven or simply in the



air. In the opinion of many specialists, rapid freezing will become the main form of handling produce on the border between the 20th and 21st centuries.

Products at low temperatures are in a sort of anabiosis, completely preserving their valuable original qualities for the entire course of storage (a year or more). But the advantages of the rapid freezing method do not end here: these products are always ready for the consumer--they have no inedible parts; as a rule the produce has dietetic properties, its microbiological safety is guaranteed, and finally it is always convenient, in the freezer compartment of the home refrigerator. In addition, this method requires only one single sorting of the fruits--at the refrigeration combine, during preparation for freezing.

#### From Refrigerator to Refrigeration Combine

Organizing the production of rapid-frozen goods is a serious task. In essence, the idea is to industrialize all stages of handling fruit and vegetable products following the collection of the harvest. In order to do this, first of all, it is necessary to have equipment for efficient preliminary cooling of collected fruits and vegetables--portable (collapsible or inflatable) cooling chambers which would be set up on the field in direct proximity to the place of collecting the harvest.

Second, it is necessary to increase the output of isothermal transport using modern methods of cooling (for example, spraying liquid nitrogen or CO<sub>2</sub> in refrigerator chambers).

Third, the main thing: storage refrigerators, distributing refrigerators, and others must give way to the refrigeration combine--a major enterprise fitted out with facilities for rapid freezing of every sort of produce--from berries to potatoes and cauliflower.

The refrigeration combine will also include processing shops--a canning shop, pickling shop, drying shop, and others which will help to reduce the amount of waste to a minimum. The transport equipment needed to take away waste and substandard produce will simply become unnecessary.

The first steps toward "produce emancipation" in our country have already been taken. Rapid freezing facilities have been created which can be used to obtain produce of the very highest quality. Refrigeration combines where these facilities will have a place are being designed and constructed, and the production of rapid-frozen goods is being organized in cities, rayon centers, and on the base of existing refrigerators.

The final link of the refrigeration chain are being put into place. Low-temperature refrigerators and counters for selling places have appeared. A new generation of consumer refrigerators has appeared, with a freezer compartment having a capacity from 40 to 220 liters and a temperature no higher than -18 degrees (stamped with three snowflakes). These are the combination models Minsk-25, Biryusa-18, and Minsk-17, Minsk-18, and Biryusa-14 freezers.

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CSO: 1841/82

## ADVANTAGES OF IODINE STERILIZATION

Moscow KHIMIYA I ZHIZN in Russian No 9, Sep 85, pp 8-9

[Article by M. Krivich and O. Olgin: "What About Iodine?"]

[Excerpts] Tap water is most often purified with chlorine. But you don't have to have a delicate palate in order to distinguish chlorinated water from spring water. Even a light aftertaste of chlorine can thoroughly distort our taste perceptions, so the addition of chlorine, although it is sometimes used even to sterilize food products, has not become widespread. In principle it is possible to sterilize with peroxides but they are too unstable for use on the industrial scale. P. G. Tatarov, deputy director of the Moldavian Scientific-Research Institute of the Food Industry, suggests that the greatest effect for the least expense may be obtained by using iodine sterilizing agents. Or, as they are already called, iodophors--that is, carriers of iodine.

The sterilizing properties of iodine are so well-known that it is not necessary even to remind the reader about them. But it should be kept in mind that iodine drugs are used to treat not only small wounds, abrasions, and cuts, but also mucous membranes (for example, Lugol's solution, an iodine-glycerine mixture, is used to coat the throat when it is inflamed). And other iodine drugs are also taken internally.

In general, even extremely delicate medicine acknowledges the safety of iodine drugs. But pure iodine also has a smell which is not too pleasant, and besides that it irritates the mucous membranes. So what is used in medicine is frequently not pure, molecular iodine, but complexes of iodine with polymers. These are iodophors, with practically none of the irritating odor or causticity characteristic of iodine in solutions.

When the alluring idea of using iodine in the canning industry arose, it was not necessary to go far to find a carrier. Every schoolchild knows the starch reaction: if you put drops of strongly diluted iodine solution onto a slice of potato, a characteristic blue color appears. The complex which forms during this is called iodine starch. No one studied this compound in a serious fashion: It was known that starch turns blue under the action of iodine, and for analytic purposes this was fully adequate.

But this reaction which has so long been familiar to chemists might turn out to be extremely useful for the food industry. The main thing arousing

interest about that is the fact that starch is a food product, moreover it is not only nontoxic but even useful. And its compounds with iodine--fully stable compounds--possess marked antimicrobial properties. They annihilate bacterial flora, yeasts, and molds--in short, everything that threatens food products.

For medical workers, the antimicrobial properties of iodine starch are not a novelty, they use it in heterogeneous form, or more simply speaking, in the form of a paste. In order to treat equipment, a liquid is necessary, of course, capable of washing all the sides uniformly. In order to do this, starch is partially oxidized. The big molecules are broken up obtaining a product which is soluble in water, and when iodine is introduced into the solution it turns into a dark blue, fairly thick liquid--MIS, modified iodine starch. For use on instruments it is diluted 100 times, to a concentration of less than 1 g/l.

The basic characteristic of the preparation is that it can be used more than once. After all, the active principle is elemental, free iodine. And it is constantly being released from the complex, gradually, a little at a time. In this regard, MIS is much like delayed-action medicines, which release a drug into the body over a long period of time, as it is detached from its carrier. In general, a single barrel of MIS will suffice for a large shop in a modern canning plant for a season.

#### Synthetic Version

One fact is preventing the widespread use of the iodine preparation: since starch is a food product, some doubts arise as to whether it should be used as an antiseptic.

This opinion is scarcely well-founded. In the first place, the concentration of starch in the working solution is very small. In the second place, what could be better for a food environment than a food product? Furthermore, in order to preserve all the grape juice of Moldavia, 5 tons, or in a very productive year 10 tons, of starch would be sufficient....

But nevertheless, if starch will not serve the purpose for some reason, there is another version in reserve, one which is strictly synthetic: an antiseptic based on a compound of iodine with polyvinyl alcohol. This combination is also well-known in medicine; a blue solution (and in this case a colored complex forms) called "iodinol" is used to fight infections and inflammations. And overall polyvinyl alcohol is one of the most popular medical polymers, whose safety for humans has been proved over and over. It is true that the medicine is not fully suitable for the food industry (it is not stable enough), but a simple modification--increasing the concentration of iodine and reducing the pH of the environment--completely resolves this problem.

As for aggressiveness with regard to microbes, here the starch and synthetic preparations are approximately equal. Here are some data obtained during industrial testing at Kishinev Canning Plant (in 3-liter glass bottles). After the usual, very thorough washing, each square centimeter of the glass surface contains from 10,000 to 100,000 bacterial cells. After sitting in an

iodine solution for 2-5 minutes, this number is reduced to 100. After an hour it is reduced to zero.

### Pleasant Surprises

Approximately the same antiseptic solution which is used to treat both large pieces of equipment and glass bottles, it turns out, can be used to protect fresh fruits directly. This is especially advantageous for delicate fruits which decay and spoil easily--peaches, plums, grapes. For once, the technique is simple in the extreme: the fruits are dipped in a still more dilute solution of the iodine-polymer complex (probably iodine starch will still be preferable in this case), then dried in the air--and that is all. After this the fruits keep beautifully for several months.

The point is, that in contrast to many permitted and frequently used antiseptics (for example, chlorine compounds and ammonium salts), which are ecologically very impure, iodine compounds are not only safe for the environment but even eliminate an error permitted by nature.

In certain southern regions of the country, including Moldavia, doctors observe an inadequate amount of iodine in the drinking water. In order to protect the population from possible illnesses connected with iodine deficiency, iodine is specially added to food products, especially salt (although it is probably more effective in bread). But the best thing of all, of course, is to enrich the drinking water with iodine. This is exactly what occurs when waste waters are released which contain nothing except for an iodine complex with biologically harmless (polyvinyl alcohol) and even useful (starch) polymers.

And finally--about the economy. Chemical and thermal sterilization cost approximately the same amount. At the end of treatment, the sterilizing solution must be driven out with sterile air or nitrogen, and this also requires expenses; but the degree of sterilization in the iodine method, as already noted, is substantially higher than in all the others. And that is where we come to processing cans and bottles--the very same "little package" which comes into our home--a septic packaging using harmless chemical methods will turn out to be more advantageous here.

And here is something which is very important for plants which do not have much experience with chemical synthesis. The technique is reduced to two operations: solutions of iodine, potassium iodide, and polyvinyl alcohol must be poured into a single container and stirred. That's all there is to it.

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NUTRIENT PHOSPHATE SHOP OPERATIONAL AHEAD OF SCHEDULE

Moscow SELSKAYA ZHIZN in Russian 13 Sep 85 p 1

[Article by Ye. Golovan: "Phosphates Ahead of Schedule"]

[Text] Sumy. Chemists and installers of the Sumy Khimprom Production Association reached the planned output capacity of the defluorinated nutrient phosphate shop 2 months ahead of schedule. Since the beginning of the year the shop produced 32,000 tons of the valuable product for the needs of animal husbandry.

In 7 months the association collective exceeded the plan for production of the new product by 3 million rubles; more than half of this amount earned the Emblem of Quality.

11004

CSO: 1841/105



PROSPECTIVE FOODSTUFF DYES FROM PLANTS IN AZERBAIJAN

Baku DOKLADY AKADEMII NAUK AZERBAYDZHANSKOY SSR in Russian Vol 41, No 6, 1985  
(manuscript received 4 Feb 83) pp 62-65

KASUMOV, M.A., Institute of Botany imeni V.L. Komarov, Azerbaijan SSR Academy  
of Sciences

[Abstract] A brief review is provided of some of the more important plants in Azerbaijan that may serve as a source of pigments to replace synthetic colorants used in the food industry. Among the plants considered are members of *Sambucus* genus, particularly *S. nigra* and *S. ebulus*, *Rhiz coriaria*, *Malva sylvestris*, and members of the *Opuntia* genus. The latter has received more attention than some of the others because of the high concentration (20-25%) of nontoxic anthocyanin pigments in *O. ficus-indica*. A dye paste obtained from *O. ficus-indica* has been approved for use in food products in Baku.

References 7: 4 Russian, 3 Western.

[79-12172/12379]

## FREE RADICALS

### USES FOR STABLE NITROXYL RADICALS

Moscow KHIMIYA I ZHIZN in Russian No 9, Sep 85, pp 38-40

[Article by Dr of Chemical Sciences A. B. Volodarskiy and Candidate of Chemical Sciences V. Yu. Nad: "New Possibilities for Nitroxyl Radicals"]

[Excerpts] The first representatives of a completely new class of substances --stable nitroxyl radicals--were obtained only about a quarter of a century ago by Soviet researchers O. L. Lebedev and S. N. Kazarnovskiy.\* Molecules of these compounds, called nitroxyl because of the N-O atom groups, are remarkable because, despite the fact that they contain unpaired electrons--that is, basically, they have free valences, they turn out to be completely stable and are even capable of entering into various chemical reactions while keeping their unpaired electron intact and safe. And since the unpaired electron gives the particles paramagnetic properties, this makes it possible to analyze them using a very sensitive physical method--electron paramagnetic resonance (EPR).

The stable radicals rapidly found application in science and technology, serving as the same sort of "labels" as radioactive atoms, but having substantial advantages over them. In particular, the stable radicals do not create any radiation danger, and they are easily put into the place the researcher needs them, whether it is a living cell or a molecule of any sort of substance. In addition, the EPR signals are extremely informative and give information about everything which is going on in the near vicinity of the unpaired electron.

#### Label for Metal

EPR signals are given off not only by free radicals but also by ions of certain transition metals containing unpaired electrons. This means that in principle the EPR method could be used for purposes of analytic chemistry as well, except for two circumstances: first, far from all ions have unpaired electrons; second, even ions of metals with unpaired electrons frequently give off EPR spectra which consist of very broad, blurred lines (Fig. 1, a). All of this makes it impossible to use EPR spectroscopy as a method of analytic identification of metals.

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\* See KHIMIYA I ZHIZN, No 12, 1982.

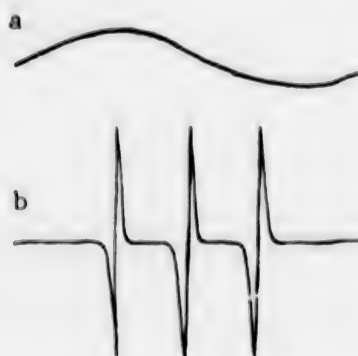


Fig. 1. EPR signals of ions of a metal which contains unpaired electrons, broad and blurred, impossible to use for analytic purposes (a); a complex compound of the same ion with a chelate-form stable radical yields strong, precise signals (b).

But stable radicals based on imidazoline can acquire the ability to form what are called chelate complexes, or chelates, with the ions of very different metals. The term "chelate" very precisely characterizes the state of affairs: two groups of atoms in an organic molecule which are able to form a bond with an atom of metal, as it were, taking it in a claw (chela means "claw" in Latin):

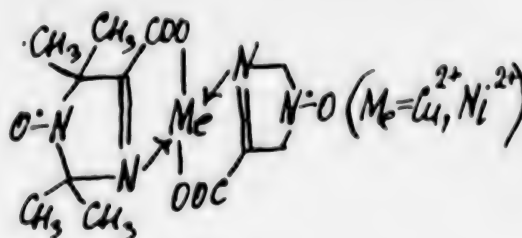


Fig. 2

And if a stable radical fitted out with "claws" is used as an analytic reagent, there arises a chelate complex which puts out precise EPR signals which are characteristic of the reagent itself (Fig. 1, b). This method makes it possible to find a single molecule of a metal complex (not only copper and nickel, but also zinc, mercury, palladium, silver, and cobalt) among hundreds of millions of other molecules, which provides a sensitivity equal to a millionth of a percent, moreover it is not impossible that this can be raised even higher. And the main thing, since the EPR signal comes from the nitroxyl group, is that the presence of unpaired electrons in the ion complex-forming agent itself is not obligatory, and the method is suitable for analytic identification of practically any metal.

A fairly large number of various analytic reagents containing nitroxyl radicals has already been synthesized. For example, great hopes are being placed on the spin-labeled analogue of the widely known reagent 8-oxyquinoline:

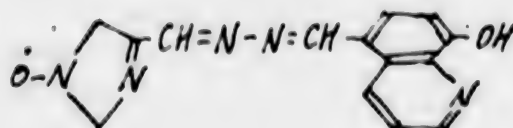


Fig. 3

This substance has an extremely high inclination to form complexes with metals.

Work in this field is going on in the USSR Academy of Sciences Institute of Geochemistry and Analytic Chemistry under the leadership of USSR Academy of Sciences Corresponding Member Yu. A. Zolotov. Researchers have already obtained chelate-forming agents which contain not only stable radicals yielding EPR signals but also radicals capable of intense fluorescence. This makes it possible to study the metal complexes simultaneously with two very sensitive methods.

Finally, it is very important that the EPR spectra of chelate complexes of metals yield detailed information on the structure of these interesting chemical formations.

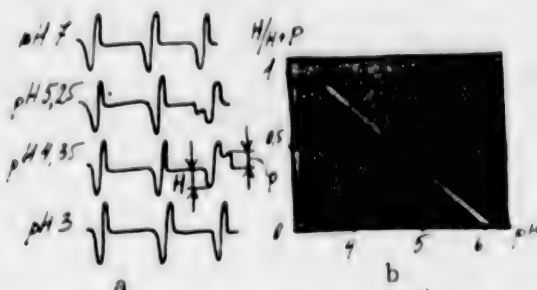


Fig. 4. The nature of the EPR spectrum of the imidazoline radical depends on the acidity of the environment (a); on a calibrated graph the pH value can be determined with great precision (b).

#### What Occurs in the Cell

Precise measurement of the pH inside a living cell became possible only after the ability of one of the stable imidazolidine radicals to attach a proton reversibly was discovered:

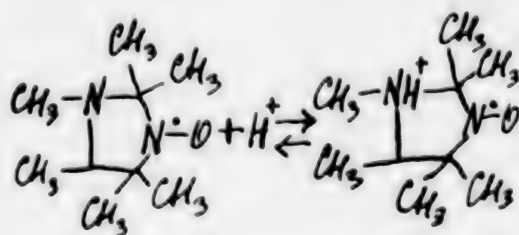


Fig. 5

The protonated radical is remarkable in that its EPR spectrum is distinct from the EPR spectrum of the original radical, moreover the nature of the signal can be used to determine the acidity of the environment with high precision (Fig. 2, a, b). Introducing a negligible quantity of the stable indicator radical into a living cell does not present any difficulties.

Until recently, the stable radicals were fairly difficult compounds to obtain. Currently the experimental chemical shop of the USSR Academy of Sciences Siberian Department Novosibirsk Institute of Organic Chemistry is synthesizing stable iminoxyl radicals in quantities ranging from dozens of grams to dozens of kilograms. So that there are no technical obstacles to taking advantage of all the opportunities which stable radicals are opening up for science and practice.

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## FREE RADICALS. REPORT 23. REACTION OF TRIPHENYLMIDAZOLYL WITH CH-ACIDS

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 21, No 8, Aug 85  
(manuscript received 2 Apr 84) pp 1616-1621

TANASEYCHUK, B.S., BELOZEROV, A.I., SANAYEVA, E.P. and BUTIN, K.P., Mordov State University imeni N.P. Ogarev, Saransk; Moscow State University imeni M.V. Lomonosov

[Abstract] An EPR study shows that the triphenylimidazolyl radical is capable of dehydrogenating beta-dicarbonyl compounds that are high in enol content. The rate of dehydrogenation increases with pKa of the enol. Formation of short-lived radicals during dehydrogenation of CH-acids with triphenylimidazolyl was confirmed by spin-capture with 2,4,6-tribromonitrosobenzene. The diphenylaminyl radical can also dehydrogenate non-enolizing CH-acids that have a sufficiently acidic CH-bond. Figures 2; references 20:  
9 Russian, 11 Western.  
[123-12765/12379]

STRUCTURE OF COMPOSITE ADSORBENTS: FINELY DISPERSED CATION EXCHANGER KRS-8p  
IMMOBILIZED IN POLYVINYL ALCOHOL GEL

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 9, 1985 (manuscript  
received 26 Oct 83) pp 2250-2253

KOLOMEYTSSEV, O.P., ZAYTSEV, P.I., MALKO, Ye.I., VOROBYEV, V.P. and  
GAVRYUCHENKOVA, L.P., All-Union Scientific Research Institute of Highly  
Purified Biopreparations, Leningrad

[Abstract] A composite adsorbent was prepared by mixing finely dispersed (1-5  $\mu\text{m}$ ) cation exchanger KRS-8p with 4% aqueous solution of polyvinyl alcohol cross-linked with glutaraldehyde. The mixture was adjusted to pH 1.5 with hydrochloric acid and mixed with oil to yield 0.1-0.5  $\mu\text{m}$  droplets, followed by solidification at 50°C for 2 h. A series of samples of the composite adsorbent were prepared, containing 20-90 wt% of the dispersion and 1.5-12 mole% glutaraldehyde. The adsorbents were analyzed by thermal argon desorption and mercury porosimetry, and subjected to electron microscopic examination. Tabulated data are provided on the specific surface areas and pore volumes. In terms of the porous structure, an optimal adsorbent was identified as containing 80 wt% of dispersion and 6 mole% glutaraldehyde, possessing a specific surface area of  $13.1 \times 10^{-3} \text{ m}^2/\text{kg}$  and total pore volume of  $0.42 \times 10^{-3} \text{ m}^3/\text{kg}$ . Figures 3; references 11: 7 Russian, 4 Western.  
[129-12172/12379]

UDC 541.123.31

INTERACTION OF INORGANIC ACIDS WITH PHENYLCARBAMIDE AND PHENYLTHIOCARBAMIDE

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 30, No 9, 1985 (manuscript received 22 Mar 84) pp 2402-2406

DZHARKESHEVA, Sh.A. and NURAKHMETOV, N.N., Kazakh State University imeni S.M. Kirov

[Abstract] Study of interaction of 10 inorganic acids with phenylcarbamide and phenylthiocarbamide by an isothermic method is described and discussed. Study of heterogenous equilibria was carried out at 0°, 20° and 40°C in systems with phenylthiocarbamide and at 20°C in systems with phenylcarbamide. Formation of 12 new complex compounds of inorganic acids and phenylthiocarbamide of equimolar composition was established. Effect of the phenyl radical on solubility of amides, on quantity and composition of the forming compounds, on the nature of dissolution of solid phases in water, on temperature and concentration boundaries of crystallization of these compounds in a solution are discussed. Phenylthiocarbamide forms only one series of compounds of equimolar composition with acids, just as phenylcarbamide does, but their formation begins at higher concentrations of the same acid than is the case for phenylcarbamide. Figures 4; references 12: 6 Russian, 6 Western. [69-2791/12379]

UDC 547.346+547.572

PICRYL DERIVATIVES OF ACETOACETIC ESTER AND ACETONE. REACTIONS WITH BASES

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 21, No 8, Aug 85 (manuscript received 23 Nov 83) pp 1647-1652

ONYSKO, P.P., PROKLINA, N.V. and GOLOLOBOV, Yu.G., Institute of Organic Chemistry, UkSSR Academy of Sciences, Kiev

[Abstract] The synthesis of new derivatives of picrylacetoacetic ester has practical interest since nitroaromatic compounds of this series include some effective pesticides. In the present work the reactions of picrylacetoacetic

ester and picrylacetone with bases (alcoholates, amines and phosphazo compounds) were studied. These reactions result in deprotonization of the carbonyl portion of the molecule. Trinitrobenzene reacts with acetoacetic ester anion to form a stable 1:1 delta-complex at the alpha-carbon atom. References 20: 7 Russian, 13 Western.  
[123-12765/12379]

UDC 547:541.124

THERMOCHEMICAL AND KINETIC STUDY OF REACTIONS OF 1,3-DIPOLAR CYCLO-ADDITION WITH COMPOUNDS INCLUDING ARYLAZIDES AND NITRONES

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 21, No 8, Aug 85  
(manuscript received 27 Feb 84) pp 1772-1776

SAMUILOV, Ya.D., MOVCHAN, A.I., SOLOVYeva, S.Ye. and KONOVALOV, A.I., Kazan State University imeni V.I. Ulyanov-Lenin

[Abstract] A calorimetric study was made of the 1,3-dipolar cyclo-addition of arylazides to pyrrolidene-cyclohexene and endo-dicyclopentadiene, and C-benzoyl-N-phenylnitrone to substituted norbornenes to characterize thermochemically the reactions of 1,3-dipolar addition of arylazides and nitrones. From the resulting data a comparison was made of the enthalpies and localization energies of the arylazides and nitrones. In the reactions of C-benzoyl-N-phenylnitrone with substituted norbornenes, the opposing influence of donor-acceptor interaction and localization effects results in a loss in condensation sensitivity and a change in the electronic nature of the substituent in the dipolarophile. References 17: 10 Russian, 7 Western.  
[123-12765/12379]

## ORGANOMETALLIC COMPOUNDS

### CHEMISTRY OF ORGANOSILICON COMPOUNDS IN 1984

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR: SERIYA KHIMICHESKAYA in Russian  
No 4, 1985 pp 498-503

[Article by E. Lukevits]

[Excerpts] The seventh international symposium on the chemistry of organosilicon compounds was held in September 1984 in Kyoto, Japan. The latest accomplishments of the chemistry of this class of compounds were generalized, and the results obtained in the last 3 years since the time of the preceding symposium (Budapest, 1981) were generalized. Five hundred seven scientists from 18 countries took part in the symposium's proceedings. The Soviet Union was represented by Academician G. A. Razuvayev (Chemistry Institute, USSR Academy of Sciences, Gorkiy), USSR Academy of Sciences Corresponding Member O. M. Nefedov (Institute of Organic Chemistry of the USSR Academy of Sciences) and Latvian SSR Academy of Sciences Corresponding Member E. Ya. Lukevits (Institute of Organic Synthesis, Latvian SSR Academy of Sciences).

The greatest attention was devoted at the symposium to the synthesis and study of the properties of new types of organosilicon compounds containing Si-C and Si-Si double bonds, and to use of organosilicon compounds in organic synthesis containing a  $\pi$ -system in the organic radical. Research on the structure and reactivity of silicon- and carbon-functional organosilicon and elemento-organic silicon compounds also enjoyed further development.

Hydrosilylation of acetylene compounds (alcohols, ethers, amines, esters, silyl-, aryl- and adamantylacetylene) by aryl- and hetarylsilanes leads to formation of beta-trans and alpha-isomers, the ratio of which varies from 100 percent beta (in the case of donor substituents) to 100 percent alpha (high-acceptor substituents) depending on the structure of the acetylene compound. The quantity of beta-isomer grows with growth in the quantity of phenyl, furyl and thienyl groups in the hydrosilane molecule, but the changes are significantly smaller than in the case of change in structure of an unsaturated compound (E. Lukevits, Institute of Organic Synthesis, Latvian SSR Academy of Sciences).

A new parameter for evaluating the strength, energy and length of the Si-N bond in aminosilanes and coordination compounds was proposed--the constant of spin-spin cleavage of  $^{29}\text{Si}$ - $^{15}\text{N}$ , which can be determined both from  $^{29}\text{Si}$



NMR spectrums and from  $^{13}\text{N}$  spectrums (E. Kupche, E. Liyepinsh, E. Lukevits, Institute of Organic Synthesis, Latvian SSR Academy of Sciences).

Biologically active organosilicon derivatives of furan and thiophene were obtained in the Institute of Organic Synthesis of the Latvian SSR Academy of Sciences (neurotropic activity of the depriming type; anticonvulsants).

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CSO: 1841/72

## COMPLEX COMPOUNDS OF MERCURY (II) AND SILVER (I) AND FOLIC ACID

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 30, No 9, 1985 (manuscript received 2 Feb 84) pp 2243-2247

ANISIMOVA, L.G., TATAYEV, O.A., GOLOVINA, A.P., KAZANBEKOV, R.G. and MAGOMEDOVA, Z.A., Dagestan State University imeni V.I. Lenin, Moscow State University imeni M.V. Lomonosov

[Abstract] Spectroscopic study of interaction of silver (I) and mercury (II) ions with folic acid in an aqueous solution was carried out with the aid of SF-44 and Specond UV-Vis spectrophotometers. The silver and mercury ions form  $[Me^n + (folic\ acid)_n]$  type compounds with folic acid. Stability constants of the compounds formed, calculated with use of spectrophotometric data, equal  $(0.832 \pm 0.015) \cdot 10^5$  for the silver complex and  $(0.320 \pm 0.010) \cdot 10^5$  for the mercury (II) complex. The mechanism of the reaction of interaction of the ions of the metals with folic acid is described, diagrammed and discussed. Figures 5; references 12 (Russian).  
[69-2791/12379]

UDC 546.732:547.461.3

## COORDINATION COMPOUNDS OF COBALT (II) AND DIBASIC CARBOXYLIC ACIDS

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 30, No 9, 1985 (manuscript received 8 Feb 84) pp 2297-2303

GUSEYNOV, M.G., Institute of Organochlorine Synthesis, AzSSR Academy of Sciences

[Abstract] Diaquo-bis-hydridocarboxylates of metals and bidentate carboxyl groups were synthesized by interaction of saturated carboxylic acids (malonic acid and succinic acids) or their derivatives with mixtures of organic salts in an organic solvent medium and studied by infra-red spectroscopic and derivatographic methods. Complexes obtained readily enter into condensation reaction with alcohols and amino-containing substances and form useful corresponding O- and N-containing compounds. The cobalt diaquo-bis-aminoethylenamidodisuccinate is much more stable than the initial cobalt diaquo-bis-hydridodisuccinate because, during interaction of the initial diaquo-bis-hydridodisuccinate and the ethylenediamine, there is a condensation reaction via the carbonyl and hydroxyl groups and its molecule is additionally bound with fragments of 2 molecules of ethylenediamine and becomes more compact. Figures 3; references 15: 11 Russian, 4 Western.  
[69-2791/12379]

## SYNTHESIS, GR SPECTRA AND MAGNETIC PROPERTIES OF MONOMERIC COORDINATION COMPOUNDS OF IRON (III) AND TETRADENTATE S-ALKYLISOTHIOSEMICARBAZIDES

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 30, No 9, 1985 (manuscript received 22 Mar 84) pp 2309-2315

SHOVA, S.G., YAMPOLSKAYA, M.A., ZEMSKOV, B.G., GERBELEY, N.V., TURTE, K.I. and IVLEVA, I.N., Institute of Chemistry, MSSR Academy of Sciences; All-Union Scientific Research Institute of Physical Technical and Electronic Measurements (Mendeleyevo)

[Abstract] Production of a new systematic series of monomeric high-spin complexes of iron (III) by the template synthesis method or by acid splitting of  $\mu$ -oxo-dimers is described and discussed. These complexes make it possible to trace the change of the electronic state of the central ion as a function of the ligand environment. Typical features of specific and magnetic behavior of compounds seen in the temperature-dependent asymmetry of the gamma radiation spectra and decrease of the magnetic moment at low temperatures are attributed to splitting of the basic energy  $^6S$  in the null field and to magnetic relaxation processes. Figure 1; references 16: 11 Russian, 5 Western. [69-2791/12379]

UDC 547.245

UNSATURATED  $\alpha,\omega$ -DICARBOMETHOXYSIANES

Baku DOKLADY AKADEMII NAUK AZERBAIJZHANSKOY SSR in Russian Vol 41, No 6, 1985 (manuscript received 22 Feb 83) pp 29-31

SULTANOV, R.A., SARYYEV, G.A. and SULTANOVA, M.Sh., Sumgait Branch, Azerbaijan Institute of Petrochemistry imeni M. Azizbekov

[Abstract]  $\alpha,\omega$ -Dicarbomethoxy silanes were synthesized by catalytic addition of silicon dihydrides ( $H_2SiR_2$ ) to 1-propargyloxy-2-carbomethoxyethane. The diesters, obtained in yields approaching 85% with the use of  $H_2PtCl_6$  catalyst, reacted readily with lithium aluminum hydride to give organosilicon alcohols. References 2 (Russian). [79-12172/12379]

## TUNNEL TRANSFER OF ELECTRONS FROM ELECTRON-EXCITED COPPER PORPHYRIN MOLECULES TO ACCEPTORS

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 9 Sep 85 (manuscript received 3 Apr 84) pp 1210-1218

KhAYRUTDINOV, R.F., ASANOV, A.N., BRIKENShtEYN, Ye.Kh. and STREKOVA, L.N.,  
Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Research on photochemical redox reactions of metal porphyrins of great interest both from the standpoint of determining a mechanism for separation of charges during photosynthesis, and the possibility of developing an effective system for converting solar energy into chemical energy. In the present work a study was made of the phototransfer of electrons from copper porphyrins (CuP) to acceptor molecules of tetranitromethane in a glassy matrix. The transfer process of an electron from a triplet-excited CuP molecule to an acceptor molecule is shown to be a tunnel mechanism for over a significant distance. The effectiveness of electron transfer is a function of reagent orientation. The role of orientation factors in redox reactions of metal porphyrins in the condensed phase is discussed. Figures 3; references 24: 12 Russian, 12 Western.  
[k20-12765/12379]

UDC 546.41+546.+546.185

REACTION OF CALCIUM AND MAGNESIUM IONS WITH ANIONS OF PHYSIOLOGICALLY ACTIVE ALPHA-HYDROXY-GAMMA-DIMETHYLAMINO PROPYLIDENE DIPHOSPHONIC ACID IN AN AQUEOUS SOLUTION

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 30, No 9, 1985 (manuscript received 28 Feb 84) pp 2248-2254

KONSTANTINOVSKAYA, M.A., SINYAVSKAYA, E.I., YATSIMIRSKIY, K.B., KABACHNIK, M.I., MEDVED, T.Ya., POLIKARPOV, Yu.M. and SHCHERBAKOV, B.K., Institute of Physical Chemistry, UkSSR Academy of Sciences (Kiev); Institute of Heteroorganic Compounds, USSR Academy of Sciences (Moscow)

[Abstract] Complex salts of tetra-basic calcium and magnesium salts of alpha-hydroxy-gamma dimethylamino propylidene phosphonic acid (AMOK) were synthesized and studied in order to explain the method of coordination of the ligand in them and the behavior of their salts in an AMOK solution under conditions closely resembling physiological conditions ( $\text{pH} \sim 6.7$ ;  $\mu = 0.1$ ). Nitrogen atoms in salts of the anions are deprotonated and may participate in formation of a bond with  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  ions. Comparison of some properties of the amino-containing phosphoric acid and properties of hydroxyethylidene diphosphonic acid, which is used most frequently to model inorganic pyrophosphates, is discussed. Medical and biological tests of various diphosphonates showed that their capacity to regulate calcium metabolism in the body depends upon the composition and structure of the ligand, which determines the properties of the complexes. The aminopropylidene diphosphonic acid studied surpasses hydroxyethylidene diphosphonic acid in some respects. It is assumed that the presence of an amino group capable of participating in coordination with the metal ensures formation of stable polycyclic soluble complexes. Figures 3; references 15: 11 Russian, 4 Western.  
[69-2791/12379]



## ANTIOXIDANT ACTIVITY OF SYNTHETIC GLYCEROPHOSPHOLIPIDS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 9, 1985 (manuscript received 4 Nov 83) pp 2283-2286

SHERSTNEV, M.P., KLEBANOV, C.I. and VLADIMIROV, Yu.A., 2nd Moscow State Medical Institute imeni N.I. Pirogov

[Abstract] A series of 12 glycerophospholipids derivatized with phenol congeners were tested for their antioxidant activities in a system consisting of yolk lipoproteins in ethanol, with chemiluminescence induced by addition of ( $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ ). Highest antioxidant activity in terms of fluorescence quenching was exhibited by 4-gamma-hydroxypropyl-2,6-di-tert-butylphenol. Longer chain fatty acids as well as an additional glycerol moiety diminished the effectiveness of antioxidant activity of the glycerophospholipids. The latter was attributed to the difficulty of insertion of such molecules into the lipoprotein particles. Figures 2; references 8 (Russian).  
[129-12172/12379]

## PETROLEUM PROCESSING TECHNOLOGY

### PETROLEUM AND GAS OF WESTERN SIBERIA PROGRAM DEVELOPMENT

Moscow TEKHNIKA I NAUKA in Russian No 8, 1985 p 14

[Article by Z. Shaykutdinov, doctor of technical sciences, Ufa: "For the Program 'Petroleum and Gas in Western Siberia'" under the rubric: "Meeting the 27th CPSU Party Congress"]

[Text] After a regular 25-30 kilometer section of a main large diameter gas line is installed, its interior surface has to be carefully cleaned of dirt and corrosion products. Therefore a cleaning piston propelled by compressed gas is sent through the pipe two or three times.

Normally commercial gas is used for these purposes, and it is taken from the nearest segment of the pipeline which is being built, either from one in use or from one just started up. Cleaning of the 30-kilometer segment of the 1.420 millimeter diameter mainline is rather expensive, since there are almost 750 thousand cubic meters of gas vented into the atmosphere, and this costs more than 20 thousand rubles.

Secondary, analogous work on this same segment of the gas pipeline is done after it has been hydraulically pressurized. This means that there will be expended and lost the same amount, and most often even more gas.

It is understandable that it is very efficient to clean the gas pipeline not with fuel gas, but with compressed air. But it turns out that we do not have in our country compressor technology which can be used for these ends. Nor is there such equipment abroad. That is exactly why at the Ufa Aviation Institute a group of young scientists and students, who have associated with the forces of the special design bureau of the faculty for aircraft engine theory, have for some time been studying, searching for a way to create economical sources of compressed air. It was shown that it is more efficient to use aircraft engines, an operating flying resource, for these purposes.

First for the needs of the gas pipeline construction personnel there was created a turbocompressor unit TKA-80/0.5 with productivity of 160-180 thousand cubic meters per hour, and which yields a pressure of 0.3 MPa. The TKA was made based on a gas generator and a turbocompressor.

At the beginning of the year the unit was tested on one section of the Urengoy-Center pipeline. Due to its small size, it was delivered to a difficult to reach spot by a KrAZ truck.

For single-pass cleansing of the 25-kilometer long segment of the 1,420 mm pipeline in winter, in complex relief areas it took only 40 minutes for the piston to pass through the pipe.

Specialists of the USSR Ministry of Petroleum and Gas Construction think that after insignificant work with its design, the proposed unit can be used on all segments of gas pipeline construction. At that time the savings will reach one million rubles per year.

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CSO: 1841/96

## IMPROVEMENT NEEDED IN SEARCH FOR OIL AND GAS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 22 Oct 85 p 2

[Article by M. Volkov, general director of the Pechorageofizika Association, Ukhta: "Effectiveness of Exploration"]

[Text] The Timano-Pechora oil- and gas-bearing province, whose area is about 400,000 square kilometers, already occupies an essential place in the fuel-energy balance of the country. But the potential opportunities for further increasing the extraction of oil and gas here are far from exhausted. Data obtained in the current 5-year period have made it necessary to radically reexamine the geological assumptions about the distribution of hydrocarbon deposits in this region. These data were at variance with the opinion of certain geologists concerning the lack of promise of regions such as the Izhma-Pechora and Khoreyverskaya basins, where oil has been obtained recently both from young and old deposits.

But the extremely complex geological structure of the province makes the search extremely expensive, requiring large outlays of time, especially in drilling deep search and exploration wells. The possibilities of accelerating the geological exploration process and making it less expensive have recently become more and more connected with using integrated geophysical methods of prospecting, mainly seismic prospecting.

Taking into account the growing role of geophysical methods of prospecting, the country has created several major specialized geophysical associations. In 1980, one such association was formed in the Timano-Pechora oil- and gas-bearing province.

The collective of our association has fulfilled the intensive targets and socialist obligations for the 5-year period in a timely fashion. During this time, over 160 new structures were prepared and put into action prospecting--more than 2 times the number of the last 5-year period. Promising oil and gas deposits have been opened up in 20 of them. An assessment of outstanding has been confirmed for the reserves of Kharyaginskoye field, whose exploration was greatly contributed to by specialists and working people of the Ukhta seismic prospecting expedition led by V. Kudryavtsev.

Today, on the threshold of the 12th Five-Year Plan, we have examined in detail the tasks and problems of further exploration in the province. It has

been set as a goal not only to increase the volumes of exploration and prospecting projects, but also to accelerate the geological prospecting process as a whole. Supporting the initiative of the AvtoVAZ Association, the collective of the association has undertaken socialist obligations which are increased in comparison to the control figures of the RSFSR Ministry of Geology. Plans call for raising labor productivity and increasing the volumes of geophysical projects by a factor of 1.5 during the 5-year period, as well as carrying out further technical and methodological reoutfitting.

The plans, frankly, are intensive. And this is understandable: the situation of today requires truly revolutionary changes in geological prospecting. Above all, the idea is to substantially reduce the times necessary for preparing new oil fields of complex structure and beginning prospecting there. And there are still a great number of these.

Take the above-mentioned Kharyaginskoye field. This structure was revealed by geophysics as early as 1964. The first prospecting well was drilled 4 years later. But the deposit was only discovered in 1977. An average of 10-15 years passed before the discovery of oil deposits in structures such as Baganskiy, Nyadeyyuskiy, and others. We must not be satisfied with such rates.

It also must not be forgotten that each deep prospecting well in the European north costs 2.5 million rubles--significantly more expensive than the country-wide average. And how many of them turn out to be unproductive! Resolving the problem of economizing on resources and gaining an advantage in time can only be accomplished by radical technical reoutfitting of our sector. For a revolution in geological prospecting for oil and gas, direct searches for hydrocarbons can and must be made using geophysical methods in combination with deep parametric drilling.

What is a direct search? It is well-known that oil or gas accumulate in the depths of the earth in what are known as traps at various depths from the surface of the earth. Their position is determined by geophysical prospecting. But the question of whether hydrocarbon raw materials will be in one trap or another can only be answered today by drilling a well. Statistics show that positive results, as a rule, are only obtained in one-third of these. And so knowing in advance that the trap is not empty could substantially reduce the number of unproductive wells.

Recently, especially after modern technology entered the arsenal of geophysicists, attempts have been undertaken more and more frequently to search directly for oil and gas. Various modifications of this method have been tested in regions of West and East Siberia, the Volga region, the Baltic region and Central Asia, and here, in Timano-Pechora province. The USSR Ministry of Geology has a unified scientific-technical council working on these problems, and there is a coordinating plan for the 11th Five-Year Plan. The first positive results have been obtained. Nevertheless, the scale of application of the progressive method does not inspire any optimism.

Let me cite as an example the Pechorageofizika Association. We have created an integrated thematic expedition, in the Vorkuta Expedition--an experimental



methodological party whose basic tasks are to develop and adopt direct searches. But the computer centers existing in Ukhta and Vorkuta do not have adequate capacity to process the materials obtained. Only two computers are planned for the association for 1986, which will not resolve the problems of computer capacities. But it is suggested that direct searching can increase the volumes of field information processed by nearly 6 times, and make fuller and more intensive use of the data obtained.

Today the geophysicists are reminiscent of people who write newspapers, but without headlines no one reads them. And it is not at all because of laziness, but rather because of the lack of the necessary funds for processing and analyzing information. The current five-year plan called for introducing a powerful specialized processing complex, the PS-3000, but its startup has been delayed. The absence of this complex could have been compensated for temporarily by a YeS 1061 (1066) type computer, but we are still lacking these as well.

At the end of last year, we received the new computerized multichannel Gorizont station. And what about it? Adjustments to it are still continuing in the sectorial institute, although the institute pays more than 5,000 rubles of depreciation allowances each month. This year we have been allocated yet another Gorizont from the funds. We will hope that it is not overtaken by the same fate as the first.

The October 1985 Plenum of the CPSU Central Committee noted that the 12th Five-Year Plan calls for significant advancement in the effectiveness of production. Rapid technical reoutfitting of all geological services, and especially geophysics, is the true path to achieving this goal in the geological prospecting sector. Outlays for modern equipment and computer technology, as practice has shown, pay for themselves many times over by accelerating work, reducing its cost, and increasing its quality.

One more sore problem must be mentioned. During his time in Tyumen Oblast, M. S. Gorbachev gave a convincing speech to the effect that in assimilating new oil and gas fields, we must not forget the necessity of "settling" individuals. Without this it is impossible to resolve major economic tasks. But today the social problems of the life of oil field workers are no less complex than the technical and production problems. In Pechorageofizika Association, over 1,200 families need housing, and hundreds of people do not even have dormitories and are registered in field crews. In order to at least partially alleviate the strain, we ourselves are engaging in construction, using our own works department. But even these efforts are sometimes reduced to nothing because of inadequate funds for materials. Cooperative construction would help to improve the situation with housing, and many of us wish to participate materially in this. But this important source too is almost never used in the north.

Naturally, we too have our unused reserves. We have tried to take them into account in socialist obligations for the 12th Five-Year Plan.

## DESULFURATION OF GASOLINE FRACTIONS IN CATALYTIC REFINING

Baku DOKLADY AKADEMII NAUK AZERBAYDZHANSKOY SSR in Russian Vol 41, No 5, 1985  
(manuscript received 30 Apr 82) pp 37-39

RUSTAMOV, M.I., corresponding member, Azerbaijan SSR Academy of Sciences,  
SAIDOVA, A.A., GUSEYNOVA, A.D. and ASKER-ZADE, S.M., Institute of Petrochemical  
Industry imeni Yu.G. Mamedaliyeva, Azerbaijan SSR Academy of Sciences

[Abstract] An analysis was conducted on the efficiency of desulfuration of gasoline fractions in relation to the temperature and chemical nature of the sulfur compounds during catalytic refining. Analysis of desulfuration vs. temperature plots demonstrated that, in the case of mercaptan sulfur, desulfuration was improved by elevated temperatures and elongation of the alkyl radical of the mercaptan compound. In the case of gasolines with sulfides and disulfides, increased temperature had an adverse effect on sulfur removal, with an increase in residual sulfur in the gasoline remaining after treatment. However, elongation of the alkyl radical in the case of sulfides and disulfides promoted desulfuration. A similar temperature dependence was noted in studies with gasoline fractions containing aromatic sulfides, disulfides and thiophene. Figures 2; references 2 (Russian).  
[78-12172/12379]

## POSSIBLE METHOD FOR IMPROVEMENT OF GAS YIELDS FROM DEPOSITS

Baku DOKLADY AKADEMII NAUK AZERBAYDZHANSKOY SSR in Russian Vol 41, No 5, 1985  
(manuscript received 21 Jun 84) pp 65-69

ABASOV, M.T., academician, Azerbaijan SSR Academy of Sciences, VEZIROV, D.Sh.,  
ORUDZHALIYEV, F.G., OPRITS, M.A. and KHISMETOV, T.V., IPGNN [expansion  
unknown], Azerbaijan SSR Academy of Sciences

[Abstract] Studies were conducted on the efficiency with which gas traps in various fields are susceptible to oxidation by oxygen in the air as a means of inducing thermooxidative increase in temperature and pressure and, thereby, improve recovery. Comparison with data derived for thermooxidation of oil demonstrated that a lower thermal pulse is required for gas condensates. This has been attributed to higher seam temperature and pressure in the gas deposits, and the relatively lower density of the liquid hydrocarbons. This combination of factors favors a lower threshold temperature on oxidation. Thus, combustion can be initiated in the deposits without the need for additional heat, which suggests that such an approach may be feasible in deep gas fields. Figures 2.  
[78-12172/12379]

## TWO-STAGE PRODUCTION OF ENDOTHERMIC GAS FROM PROPANE AND BUTANE

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 5, Sep-Oct 85 (manuscript received 19 Apr 85) pp 23-26

MESHENKO, N.T., VESELOV, V.V., SPIVAKOV, Yu.A., PUSHKAREV, L.I. and MAYERGOYZ, I.I.

[Abstract] A two-stage process was designed for the production of endothermic gas from propane and butane. In the first stage the feed gas is treated with a small volume of water vapor to react with heavy hydrocarbons and form a methane-containing gas. The first, low temperature (330°C) stage, can be described by the following reaction:  $C_nH_{2n+2} + 0.5(n-1)H_2O = 0.25(3n+1)CH_4 + 0.25(n-1)CO_2$ . The second stage consists of high temperature (1020°C) conversion under air of methane to yield a gas of the desired composition. Basically, the overall reduction can be described by  $CH_4 + 0.5O_2 = CO + 2H_2$ . These studies led to the design and construction of a propane/butane processing installation available from the Chadyr-lungskiy Electromechanical Equipment Plant. Figures 2; references 5 (Russian). [135-12172/12379]

UDC 547.717'464.2'461'29'26.07

DERIVATIVES OF AZIRIDIN-1,2-DICARBOXYLIC ACID

Riga KHIMIYA GEOTEROTSIKLICHESKIKH SOYEDINENIY in Russian Vol 218, No 8, Aug 85 (manuscript received 8 Oct 84) pp 1070-1074

TRAPENTSIYER, P.T., KALVINSH, I.Ya., LIYEPINSH, E.E., LUKEVITS, E.Ya., and KAUSS, V.Ya., Institute of Organic Synthesis, LeSSR Academy of Sciences, Riga 22606

[Abstract] The methyl ester and amide of aziridine-2-carboxylic acid reacted at low temperatures with esters of chloroformic acid in the presence of triethyl amine to form esters of aziridine-1,2-dicarboxylic acid or 1-alkoxycarbonyl-2-carbamoylaziridines. Treatment of the latter with dry ammonia in methanol at 0-20°C yielded 1,2-dicarbamoylaziridin. Treatment of the original compounds with amides of chloroformic acid yielded corresponding substituted dicarbamoylaziridines, while alkyl-, alkenyl- and arylisocyanates and isothiocyanates yielded heat and substituted amides and thioamides of aziridine-1,2-dicarboxylic acid. The original methyl ester also reacted with *p*-phenylenediisocyanate and with oxalyl chloride to produce compounds with two aziridine rings and, at -30°C, with the chloroanhydride of acrylic acid to produce the  $\gamma$ -acyl derivative. Paramagnetic resonance data indicates an increasingly acceptor property of the N-substituted group in the order  $\text{CONR}_2 < \text{CSNR}_2 < \text{COOR}$ . References 6 (Western, including one Belgian patent to I.Ya. Kalvinsh and one other Soviet author). [115-12672/12379]

## POLYMERS AND POLYMERIZATION

### CONFERENCE ON HIGH-MOLECULAR WEIGHT COMPOUNDS

Alma-Ata KAZAKHSTANSKAYA PRAVDA in Russian 20 Oct 85 p 3

[Article by V. Korshak, academician, chairman of the organizing committee of the 22nd All-Union Conference on High-Molecular Compounds, and B. Zhubanov, academician of the Kazakh Academy of Sciences, deputy chairman of the organizing committee: "Chemistry and Polymers"]

[Text] The 22nd All-Union Conference on High-Molecular Compounds was held in Alma-Ata. Its participants were leading scientists and chemists of the country and the republic, responsible workers of the State Committee for Science and Technology, the USSR Ministry of Chemical Industry and USSR Ministry of Petroleum Refining and Petrochemical Industry, and a number of other sectorial ministries and departments of the country and of Kazakhstan. More than 50 papers were given at plenary and section meetings on urgent questions of chemistry and physical chemistry, and tasks were determined both in connection with the effectiveness of using the polymers of today, and the creation of polymers of the future; "round table" meetings were devoted to problems of the industrial production of elastomers, polymer films, plastics, and fibers. Forms of information such as display cases were widely used. In all, a total of 692 papers were presented, illustrating various aspects of the synthesis of new polymers and their processing.

There was a lively creative discussion, and a broad exchange of opinions, experience, and suggestions was achieved. According to general opinion, the conference substantially enriched the scientific assets of its participants, and gave a mighty impetus to new research. A total of about 1,200 individuals participated in the work of the forum of chemists and polymer specialists, from practically all regions of the country where scientific research is going on in this area of knowledge.

The conference in Alma-Ata determined the prospects for developing research in the field of high-molecular compounds and their production for the 12th Five-Year Plan and up to the year 2000.



What is the chemistry of high-molecular compounds? Even specialists answer this question in different ways. And they will be quite correct. For high-molecular chemistry, which sprang from its predecessor--classical chemistry--only half a century ago, has a very wide range of scientific interests and a truly limitless field of practical application.

Polymer chemistry has succeeded in many things, but it still faces much that is unknown and undiscovered, and the future promises us new accomplishments in the world of high-molecular compounds. The "harvest" in the field of this science will become more and more plentiful. And this is natural, since the material with which our science works--what are known as macromolecules, consisting of thousands of atoms of elements--has a practically inexhaustible number of combinations. This means a practically inexhaustible number of materials produced from them.

In principle we can dissect and artificially construct any macromolecule, obtaining new properties of the substance, and finding for them new, frequently unexpected fields of application. This situation, in itself, opens up unlimited possibilities for the chemistry of high-molecular compounds, and for the scientists involved in researching and synthesizing polymers.

Polymers have thoroughly invaded the sphere of producing materials, squeezing out traditional materials such as metal and wood, rivaling them in inexpensiveness and technological features. The production of polymers has become industrialized. They are already replacing 10 percent of ferrous and 3 percent of nonferrous metals. As "irreplaceable substitutes," plastics have meanwhile long since become independent materials, necessary for ensuring technical progress in industry and agriculture.

The widespread form of polymer materials is plastics. Their selection is numbered in the high thousands. And new ones are appearing literally every day. Currently the total worldwide production of plastics is measured in the tens of millions of tons, and there is nothing surprising in the estimates of experts who believe that in the near future the production of plastics will be comparable in weight to the production of steel, while in volume it will more than double it. Polymer materials are finding very wide application in key sectors of the economy--machine building, electrical engineering, and electronics. For example, the use of plastic resins is connected with the output of 80 percent of all electrical engineering goods. The concept of the chemization of agriculture now includes not only increasing the production of mineral fertilizers and plant protection agents, but also the widespread use of synthetic pipelines, films for hothouses, fish-breeding tanks, and similar items. Lacquer and varnish polymer materials have become very widespread. The production of chemical fibers now already totals more than half of the textile balance of the world, and three-fourths of all leather-form articles are created based on artificial polymer raw materials. The field of application of plastics in daily life is unlimited. It is enough, for example, to recall polyethylene, which has already become indispensable, to understand how secure a place polymer films have found in our everyday life.

In general, macromolecular chemistry is characterized by extremely close ties between new fundamental research and the practical use of results obtained.

An impressive illustration of this are the liquid crystal polymers and polymer systems which have literally achieved a revolution in the industry of super-strong fibers. As structural materials, they are opening up simply thrilling prospects in creating optical systems, and devices for recording and storing information.

The use of polymers in medical practice is extremely interesting. As a result of goal-oriented synthesis, medicines have been created which have extended or long-lasting action, and polymer structures designed for contact with the blood and tissues of the living body (biospecific hemosorbents, synthetic bandages for treating wounds and burns, endoprostheses...)

Polymer chemistry is an inexhaustible topic. Within the framework of a newspaper article it cannot be described even superficially. But one extremely important problem of the chemistry of medical-biological polymers--hemocompatibility--must be touched on. Let me remind the reader that "hemo" is from the Greek word for "blood." Apparatus for artificial circulation of blood, artificial kidneys, and artificial lungs--all of these are devices which work in contact with the blood. They serve their purpose. But there are no limits on improvement, and the last word has not yet been spoken. The creation of polymers whose properties are similar to the properties of the inner walls of blood vessels is truly a step toward victory over diseases of today such as, for example, myocardial infarction. Polymer chemistry is a vast contribution to human health.

Alma-Ata became the place for holding this conference. This was not an arbitrary choice. Intensive work has been done here recently on many urgent problems of polymer chemistry. There have been excellent results in studying ways of forming high-molecular compounds, studying their properties, and creating polymer articles for various uses. Here are a few of them which have become widespread in practice.

The Kazakhstan portion of the Uzen-Kuybyshev oil pipeline passes through strongly mineralized soils. No kind of insulation could save the steel pipes of the pipeline from corrosion. After 2 or 3, at most 5, years, they had to be replaced. Plastobit, a polymer and film covering developed by the Kazakh Academy of Sciences Institute of Chemical Sciences, ensures the necessary protection of pipes for 30-35 years, practically their entire service life. Now this covering is being used in many other places. A technology which the institute has worked out for obtaining fertilizers in the form of polymer phosphates has no analogues in world practice. This intensive technology is making it possible to include in processing even very lean balanced ores, which were previously thrown into dumps. But what is especially important, the phosphate fertilizers far surpass all fertilizers of this type in their effect on the growth of the crop. They have also been discovered to have a high zootechnical and physiological activity, which makes it possible to use them as a mineral additive to feed mixtures. An electrodialysis device for desalinating natural waters and industrial solutions has successfully undergone state testing and is being manufactured in series.

The list of similar innovations could go on. But to sum all this up, it must be emphasized that the institute has formed basic scientific directions which are closely connected both with the development of modern chemical science, and the republic's economy.

The plastics industry in our country is young, but its momentum far exceeds almost all other sectors of industry, and it has a special role in accelerating scientific-technical progress, which the party has advanced as the fundamental concept in developing a society of true socialism.

12255

CSO: 1841/81

## CHEAP PLANT WASTES CONSIDERED AS RAW MATERIALS FOR PLASTICS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 3 Nov 85 p 2

[Article by Candidate of Technical Sciences K. Moskatov, chairman, Committee for Polymers, Moscow City Council of the Scientific-Technical Society: "Plastics from Plants"]

[Text] This combination of words is perhaps unfamiliar to many, and not entirely understandable: Plastics are traditionally produced from petrochemical raw material. Nonetheless, there is reason for considering plants from this point of view: Yes, they are in fact fully suitable for plastic production. And their use can produce considerable benefits, all the more so because we are talking about not felling trees but utilizing the numerous annual plants that die without releasing all of the sun's energy locked within them. They are cheap: Consider how much rice straw or flax shive costs. Or, for example, sunflower shells. Cotton stems (guza-paya) can be put to work. Reeds and some pine nut shells that no one wants would be useful as well.

The term "plant plastics" was proposed in England in 1980. In principle, they have been produced in our country for a long time. For example natural fibers are used to produce ethereal cellulose materials, production of which is growing each year despite significant competition on the part of synthetic polymers. The combination of strength, nontoxicity and oil and gas resistance coupled with very good external appearance insures them stable areas of application.

Many more examples could be provided, but it still must be admitted that only a small quantity of available, almost free raw material is being utilized. This is explained by the fact that extensive research had not been conducted in this direction before. But inasmuch as the demand for polymers has begun to grow at a rapid pace in the most diverse sectors of the national economy, a large number of institutes--chiefly forestry engineering institutes--recently began working intensively with plastics from plants.

The first thing scientists began to study was the use of plant raw materials in already-existing high-output production processes which could incorporate such raw materials without great alterations. This is precisely why special attention was turned to wood-chip panels, which are produced by dozens of



installations in our country. The possibility of manufacturing them at these installations out of a number of species of nonwoody raw materials and agricultural wastes was demonstrated and confirmed by industrial practice: Grapevines, hemp, rice straw, cotton stems and peat.

The collectives of the All-Union Scientific Research Institute of Woodworking Industry and the Institute of Polymer Chemistry and Physics of the Uzbek SSR Academy of Sciences perhaps achieved the greatest successes in this direction. Owing to them, enterprises producing nonwood panels have already appeared--one at Krasnodar and another in Uzbekistan. In principle the physicomaterial properties of the new product are not inferior to those of the traditional product. The new product satisfies the requirements of the existing standard, and it can be used both in furniture making and for construction purposes. It turns out that cotton, shive and other forms of raw material having good fibrous properties may also be used to produce fiber panels--DVP panels.

These, then, are examples of utilizing cheap plant raw material in pulverized form without chemical modification. But the possibilities are not limited to just this alone. This raw material can also be processed more deeply.

Builders are experiencing an acute need for wood plastics, which are obtained as a rule from logging and woodworking wastes. But guza-paya, grapevine and rice straw are very similar in chemical composition to wood: They all contain the same ingredients in sufficient quantities--lignin and cellulose in particular. Moreover the reserves of these plant remains are sizable in the country--each year 10 million tons of guza-paya are collected, while about 2 million tons each of straw and grapevine are collected.

The possibilities of using plant remains in plastics were discovered by scientists of the Uralsk Forestry Engineering Institute. Moreover they proposed obtaining them without special binders, which simplifies the process. The results of laboratory research were confirmed with industrial equipment. Good physicomaterial properties and beautiful appearance permit use of such plastics to make partitions, suspended ceilings and panels. Thus it was demonstrated that their production is economically effective and feasible: The cost of 1 cubic meter is 75-90 rubles.

Many scientific institutions have already worked with plastics, which confirms once again that this problem is worth all of the effort. Unique experience has been accumulated in the Belorussian Technological Institute and in a number of other organizations which have also sought ways of obtaining materials in which plant raw material serves both as a filler and simultaneously as a binder.

Filled polymer production is an important sector of chemistry. Organic fillers can enjoy the widest applications, especially when mixed with inorganic substances. This two-ingredient alliance helps to improve strength, heat resistance and a number of other characteristics of the material. Research was conducted, as an example, in the problematic polymer laboratory of the Moscow Technological Institute of Meat and Dairy Industry. Their work



resulted in acquisition of something called lignoplastics, named this because the organic ingredient is represented by lignins--wastes from pulp-and-paper and biochemical industry available in large quantities. An experimental industrial lot of lignoplastic was produced at a certain enterprise in Kazan. Tests revealed the feasibility of its use in the production of packaging for meat and dairy production.

Incidentally, the problem of utilizing lignin in the national economy is important in and of itself--both from the standpoint of maintaining a thrifty attitude toward natural resources, and from the standpoint of environmental protection. Hundreds of thousands of tons of these extremely troublesome wastes, which have yet to find any uses, accumulate just at hydrolytic plants alone. This is why scientists of the Institute of Wood Chemistry of the Latvian SSR Academy of Sciences also turned their attention to these wastes. The institute's scientists have been conducting research on chemical modification of lignin for a number of years. A procedure for obtaining another form of filled polymers--ligopors of the most diverse purposes with prescribed density and strength--has been created.

In general, scientists are seeking, and as we can see, some have already found economically feasible methods of processing such wastes. But unfortunately, the practical return from this effort leaves something to be desired.

What is the obstacle to introducing such wastes into production? First there is the absence of purposeful, organized effort to utilize such raw materials. Coordination of the efforts of organizations isolated from one another, clear planning of scientific research and introduction of research results into industrial production have become an urgent necessity.

From my point of view a special scientific-technical program dealing with this program is required. It is precisely what could help us direct scientific research into a common channel. We also need to analyze the experience that has already been accumulated: What needs further work must get it, and projects that are ready for introduction must be put before the appropriate ministries. Here is another problem of no small importance: It is time to stop looking at plant raw materials as useless goods, as wastes. This would require raising the interest of agriculture and forestry in gathering such materials for industry.

11004

CSO: 1841/105

# CORROSION-RESISTANT PLASTIC REINFORCEMENT BARS

Moscow SELSKAYA ZHIZN in Russian 13 Sep 85 p 1

[Article by I. Selivanov: "Plastic Reinforcement Bars"]

[Text] Leningrad. The Znnya Truda Association imeni I. I. Lese has managed to replace massive metallic reinforcement bars by light, strong plastic structures. Plastic parts of complex configurations may be installed in pipelines at enterprises of chemical, food and pharmaceutical industry, at pig farms and in dairy complexes. In a word, wherever metallic articles are threatened by corrosion.

The new materials successfully passed production tests at the Leningrad Farmakon Plant, at dairies in the city of Omsk and in a number of other enterprises.

11004

CSO: 1841/105

## MECHANISM OF POLYMER ELECTROLUMINESCENCE

Baku DOKLADY AKADEMII AZERBAYDZHANSKOY SSR in Russian Vol 41, No 6, 1985  
(manuscript received 3 Jun 84) pp 23-26

KERIMOV, M.K., SULEYMANOV, B.A. and GEZALOV, Kh.B., Section on Radiation Research, Azerbaijan SSR Academy of Sciences

[Abstract] Spectral analyses were conducted on DC and AC induced electroluminescence of low-density polyethylene (ca. 80  $\mu\text{m}$  thick) and atactic polystyrene (ca. 30  $\mu\text{m}$ ) films vapor-coated with Al or Cu electrodes. Application of 4 kV DC at room temperature under a pressure of  $10^{-3}$  Pa generally failed to elicit luminescence. However, in some cases light pulses were detected even after the DC was discontinued and were attributed to the formation of localized areas possessing a charge greater than that of the adjacent areas in the film. These flashes, then, were due to excitation of luminescent impurities in the polymer by excited electrons in the intermolecular spaces between supercharged and normally charged areas of the polymer. With AC (1500 Hz, amplitude to 600 V) electroluminescence was dependent on the 'injected' charge with a shift to shorter wavelength emission as the voltage increased. Modification of the polyethylene and polystyrene films by infusion of a nitroxyl radical (2,2,6,6-tetramethylpiperidine-1-oxyl) enhanced electroluminescence. The enhancement was ascribed to excitation of the additional radicals by the accelerated electrons induced by AC. Figures 3; references 11: 8 Russian, 3 Western.  
[79-12172/12379]

UDC 541.49

## STRUCTURE AND CHEMICAL INTERACTION OF POLYCONJUGATE SYSTEMS

Dushanbe DOKLADY AKADEMII NAUK TADZHIKSKOY SSR in Russian Vol 28, No 5, 1985  
(manuscript received 18 Feb 1985) pp 284-288

KALONTAROV, I.Ya., POLYAKOV, Yu.N., and SHAGOV, V.S., Institute of Chemistry imeni V.I. Nikitin Tadzhik SSR Academy of Sciences; Leningrad State University imeni A.A. Zhdanov

[Abstract] Some of the distinguishing structural characteristics and chemical properties of polyconjugate systems containing conjugate C=N double bonds in their primary chain were investigated. Replacing para-benzene rings with meta-benzene rings in the chain of conjugation reduces the thermal stability of polyconjugate systems. In contrast, the introduction of benzidine groups into the chain increases thermal stability. X-ray crystallography showed that these oligomers are basically amorphous and that the percentage of the crystalline

phase is small. They crystallize between 300° and 500°C. The heterogeneous hydrogenation of the polyconjugate systems studied in benzene, toluene, and dioxane using platinum-palladic blacks, platinum oxide, and skeleton nickel as catalysts at room temperature, at 150°C and at pressures up to 20 MPa, yielded negative results, as did homogenous hydrogenation with triphenylphosphine chlororhodium. Homogeneous catalytic hydrogenation using borontrialkyls in a solution of benzene at 175 to 290°C and at an elevated pressure was successful. The polyamines obtained stained lighter, had improved solubility, unchanged molecular mass, and a lower softening point in comparison with the original polyconjugate systems. Temperature and an effective conjugation chain play an important role in borontrialkyl hydrogenation of polyconjugate systems. Ozonization was used to establish the structure of the polyconjugate systems. Figures 2; references 10: 9 Russian, 1 Western.  
[104-13050/12379]

UDC 539.4:678.071

#### TENSILE STRENGTH OF UNIDIRECTIONAL FIBROUS COMPOSITES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 283, No 6, 1985 (manuscript received 28 Jun 84) pp 1386-1390

BAZHENOV, S.L. and BERLIN, A.I., Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Mathematical analysis was applied to tensile strength determination of unidirectional fibrous composites, assuming that breakdown on uniaxial stretching can involve both viscous (plastic) yield or brittle fracture through propagation of major fissures. Transition from plastic yield to brittle fracture can occur even in the presence of a limited number of defects depending on their size and the applied stress. In the case of fibrous composites the underlying assumption is that the imbedded fibers are subjected to stretch while the matrix material imparts shear forces, since the tensile strength of the fibers is about two orders of magnitude greater than that of the matrix. An increase in the yield of the matrix leads to an increase in the tensile strength of composites that are defect-free, however it increases the susceptibility of the composite material to the effects of defects and, thereby, diminishes the tensile strength of composites with defects. Figures 2; references 11: 4 Russian, 7 Western.  
[58-12172/12379]

## PERMEABILITY OF HYDROCARBONS THROUGH SILANE-SILOXANE BLOCK-COPOLYMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 9, Sep 85  
(manuscript received 7 Feb 84) pp 1917-1924

YAMPOLSKIY, Yu.P., GLADKOVA, N.K., FILIPPOVA, V.G. and DUEGARYAN, S.G.,  
Institute of Petrochemical Synthesis imeni A.V. Topchiyev, USSR Academy of  
Sciences

[Abstract] Measurements were made of the permeation ( $P$ ), diffusion ( $D$ ) and solubility ( $S$ ) constants of saturated and unsaturated  $C_1$ - $C_4$  hydrocarbons in block polymers of vinyltrimethylsilane (A) and hexamethylcyclotrisiloxane (B) of the AB and BAB type. The data showed that with an increase in the B component both  $D$  and  $P$  evidenced a proportional increase. The relationship between  $P$  and  $D$ , on the one hand, and the composition of the block polymer, on the other, was characterized by S-shaped plots for all the hydrocarbons tested. However,  $S$  was independent of composition, indicating that the S-shaped  $P$ -composition curves reflect primarily the effects of composition of the polymers on the  $D$  parameter. Thus, these measurements suggest that the transfer of various hydrocarbons across the films under study involves different diffusion mechanisms in block copolymers of different compositions. Figures 5; references 19: 11 Russian, 8 Western.  
[94-12172/12379]

## C-13 NMR STUDIES ON MODIFICATION OF POLYETHYLENE GLYCOL-MALEINATE-FUMARATE BY ROSIN

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 9, Sep 85  
(manuscript received 9 Feb 84) pp 1932-1939

BULAY, A.Kh., SLONIM, I.Ya., URMAN, Ya.G., TSVETKOVA, O.S. and MIKHAYLOVA, Z.V., "Plastmassy" Scientific Production Association

[Abstract] C-13 NMR spectroscopy was employed in studies on the synthesis of rosin-modified unsaturated polyesters, in this case polyethylene glycol. Evaluation was conducted on three synthetic approaches: A -- initial polycondensation of ethylene glycol with maleic anhydride at 175-185°C, and subsequent addition of rosin with further heating; B -- a mixture of ethylene glycol, maleic anhydride, and fumaric acid-rosin adduct were heated at 180-190°C until an acid number of 90-90 mg KOH/g was reached; and C -- essentially method B, except that maleic anhydride-rosin adduct was used. The spectrometric data demonstrated that method C was unsuitable for the production of an unsaturated polyester modified with rosin, while methods A and B were



fairly effective. In addition, less time was required with method A for full modification than with method B. However, the probability of crosslinking with method A was greater than with method B. Figures 5; references 6: 5 Russian, 1 Western.

[94-12172/12379]

UDC 541.64:536.7

#### THERMODYNAMIC AFFINITIES OF COMPONENTS AND PHASE COMPOSITION OF PLASTICIZED POLYMETHYLMETHACRYLATE-POLYVINYL CHLORIDE MIXTURES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 9, Sep 85  
(manuscript received 6 Nov 84) pp 2003-2006

RAZINSKAYA, I.N., ADAMOVA, L.V., IZVOZCHIKOVA, V.A., BATUYEVA, L.I., TAGER, A.A. and SHTARKMAN, B.P., Ural State University imeni A.M. Gorky; Scientific Research Institute of Polymer Chemistry and Technology imeni V.A. Kargin

[Abstract] An evaluation was conducted on polymethylmethacrylate (PMMA) and polyvinyl chloride (PVC) mixtures as effected by plasticizers, depending on the affinity of the plasticizers for the components of the mixture. Determinations of the thermodynamic affinities of the plasticizers for PMMA and PVC yielded the following Gibbs energies of mixing with dibutyl phthalate (DBP): -3.4 and -4.3 J/g (showing that DBP has essentially equal affinity for both components). Trichloroethyl phosphate plasticizer showed more affinity for PMMA (-3.3 J/g) than for PVC (-1.1 J/g), while dioctyl sebacinate evidenced thermodynamic affinity for PVC (-1.6 J/g), but none for PMMA (+0.1 J/g). Electron micrographs confirmed the superiority of DBP in promoting dispersion of the components in the mixture due to its affinity for both components. The facilitation of mixing of PVC with PMMA by DBP was further confirmed by calculation of changes in the chemical potential of the components on addition of DBP, which reached values of +5.9 J/g with 10% DBP and +8.4 J/g with 40% DBP. Figures 3; references 11: 8 Russian, 3 Western.

[94-12172/12379]

UDC 541.64:681.142

#### A PRIORI CALCULATION OF WORKING CHARACTERISTICS OF POLYMERS USING COMPUTER SIMULATION OF STRUCTURAL PARAMETERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 9, Sep 85  
(manuscript received 9 Jan 85) pp 2008-2012

BERIKETOV, A.S., BOCHAROVA, L.N. and MIKITAYEV, A.K., Institute of High Molecular Weight Compounds, Kabardino-Balkar State University

[Abstract] An algorithm is presented for the calculation of fundamental physical/chemical parameters of polymers on an a priori basis to facilitate

synthesis of task-suited polymers. The basic approach is the use of the additive method that has recently gained in popularity because it is limited to information on the structure and chemical composition of compounds, and does not require recourse to other information on physical attributes of polymers. The analytical relationships derived by other workers and published in the literature deal with the assessment of the temperatures of destruction and glass transition, surface energy, dielectric permeability and solubility. An outline scheme is provided of the POISK program for the calculation of the above parameters and van der Waals volumes, and has been used in the selection of polymer structures that meet the set requirements for solubility, glass transition temperature, surface energy, etc. References 5 (Russian).  
[94-12172/12379]

UDC 541.124.7

KINETICS OF PLASMA DEIONIZATION IN Ar-F<sub>2</sub> MIXTURE

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 59, No 9, 1985 (manuscript received 30 Jun 83) pp 2306-2307

ZAYTSEV, V.V., VEKSHIN, V.A. and KLIMOV, V.D., Ivanovo State University

[Abstract] Kinetic studies were conducted on the deionization of an impulse charge in Ar-F<sub>2</sub>, with a pulse duration of  $10^{-5}$  sec and a period of  $4 \times 10^{-4}$  sec. Comparison and analysis of the plots for decay of electron concentration with time, of the frequency of electron capture by F<sub>2</sub> vs. F<sub>2</sub> concentration, and of the frequency of electron capture vs. decay time, demonstrated that dissociative electron capture by F<sub>2</sub> represents the primary process responsible for electron loss. Electron capture proceeded with a rate constant of  $2 \times 10^{-9}$  cm<sup>3</sup>·sec<sup>-1</sup> at the front of the impulse, decreasing to  $3 \times 10^{-11}$  cm<sup>3</sup>·sec<sup>-1</sup> in the persistence phase. Figures 3; references 11: 7 Russian, 4 Western.  
[129-12172/12379]

UDC 678.019.36

AGING OF RUBBER AND MODEL RUBBER SEALS IN Co-60 EMISSION FIELDS. PART 2.

Moscow KAUCHUK I REZINA in Russian No 9, 1985 pp 8-10

DEGTEVA, T.G., DONTSOV, A.A. and PRYANIKOVA, L.P.

[Abstract] Studies were conducted on the effects of exposure to Co-60 radiation on the compression modulus of various rubber samples and model rubber seals. Aging was seen to be dependent on the chemical nature of the rubber tested and the absorbed radiation dose. Analysis of radiostability sequence for a number of samples demonstrated that butadiene-styrene rubbers possess the greatest radiation stability, with the degree of stability directly proportional to the concentration of styrene monomers. Studies with rubber seals showed that in the case of most rubbers an inverse relationship prevailed between the modulus of compression and retention of hermetic seal. Rubbers

showing superior radiostability were identified as SKS-30, SKN-26 and SKEP. The basic conclusion was that formulation of rubbers with high radioresistance should avoid high concentrations of ingredients that are volatile in vacuo. Figures 2; references 10: 8 Russian, 2 Western.  
[89-12172/12379]

UDC 621.373.826

INFRA-RED LASER PHOTOLYSIS OF  $\text{CF}_3\text{I}$  MOLECULES. TRANSITION FROM NON-COLLIDING TO COLLIDING EXCITATION

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 9 Sep 85 (manuscript received 13 Sep 84) pp 1192-1197

BAGRATASHVILI, V.N., BURIMOV, V.V., IONOV, S.I., MISHAKOV, G.V., OSMANOV, R.R. and SVIRIDOV, A.P., Chemical Faculty, Moscow State University imeni M.V. Lomonosov

[Abstract] A study was made of the changes in composition of primary products of infra-red (IR) photolysis of  $\text{CF}_3\text{I}$  molecules during transition of multiphoton (MF) excitation from non-colliding to colliding modes. The concentration of non-dissociated  $\text{CF}_3\text{I}$  molecules and  $\text{CF}_2$  radicals immediately after termination of an IR pulse were determined by employing MF-ionization and laser-induced fluorescence techniques. It was demonstrated that as the pressure of initial substance is increased, the yield of IR MF-dissociation drops, while the concentration of  $\text{CF}_2$  radicals and the absorbed IR laser energy both increase. These processes result from the transition from vibrational energy during laser impulse from excited  $\text{CF}_3\text{I}$  molecules to cold  $\text{CF}_3$  radicals, and the subsequent involvement of these radicals, which have been heated to the colliding mode, into the process of IR MF-excitation. Figures 3; references 16: 10 Russian, 6 Western.

[120-12765/12379]

UDC 541.141.7

SENSITIZED DECOMPOSITION OF LIQUID SOLVENT FOLLOWING TWO-STAGE LASER EXCITATION OF DISSOLVED MOLECULES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 283, No 6, 1985 (manuscript received 9 Oct 84) pp 1425-1427

NIKOGOSYAN, D.N., ORAYEVSKIY, A.A. and LETOKHOV, V.S., Institute of Spectroscopy, USSR Academy of Sciences, Troitsk, Moscow Oblast

[Abstract] Absorption spectroscopy was employed in studies on two-state UV excitation of thymine solution and its effects on water decomposition. The correlation between quantum yields of hydrated electrons and photolytic

products was affected for a system consisting of  $1.2 \times 10^{-3}$  M thymine solution, pH 6.4 subjected to picosecond UV impulsion (266 nm wavelength,  $E = 3$  mJ,  $\tau = 23$  picosec,  $I_0 = 10^{12}-10^{14}$  W/m<sup>2</sup>,  $f = 0.5$  Hz). Mathematical analysis of the plots demonstrated that the excitation of the  $S_N$  level of thymine (via  $S_1$  state) led to highly efficient transfer of energy from the  $S_N$  level to water. The formation of hydrated electrons exceeded by an order of magnitude the efficiency of formation of the  $\text{thy}^+$  radical, reflected in the relative probabilities of formation of 6.5% and 0.65%. These observations point to similarities between the products obtained with two-stage UV photolysis and gamma radiolysis of aqueous solutions of nucleic acid components. Figures 2; references 13: 9 Russian, 4 Western.  
[58-12172/12379]



UDC 678.029.42

FORMULATION OF HIGH-TEMPERATURE AQUEOUS ADHESIVES USING POLY-1,1,2-TRICHLOROBUTADIENE

Moscow KAUCHUK I REZINA in Russian No 9, 1985 pp 6-8

BELIKOVA, S.V., POLSMAN, G.S., TROFIMOVICH, D.P. and DONTSOV, A.A.

[Abstract] Binding strength studies were conducted on various formulations of poly-1,1,2-trichlorobutadiene (PTCB) latex compounded with film-forming agents for use as high-temperature adhesives in polymer-to-metal bonding. Formulations of PTCB with 2-methyl-5-vinylpyridine (MVP) appeared to be particularly promising, with the bonding strength of the formulation attributed to interdigitation of the polymers in the aqueous medium. Superior adhesiveness was shown by mixtures of PTCB and MVP in which preformulation ammonia treatment of PTCB was held to a minimum, to assure a maximum concentration of active sites on PTCB capable of reacting with pyridine. The PTCB-MVP formulations, containing carbon black and p-dinitrobenzene, were equivalent in terms of adhesion to conventional adhesives employing organic solvents. Figures 5; references 14: 10 Russian, 4 Western.  
[89-12172/12379]

UDC 678.063.5:678.029.5:669:620.046.78

EFFECTS OF POLYEPOXIDES ON METAL CORD-RUBBER ADHESION

Moscow KAUCHUK I REZINA in Russian No 9, 1985 pp 12-15

BYSTROVA, G.N., SHVARTS, A.G. and FROLIKOVA, V.G.

[Abstract] Studies were conducted on the strength of rubber-metal cord binding as affected by introduction of polyepoxides with a view toward tire improvement. Specific analysis on binding strength was conducted with polyisoprene rubber (SKI-3-01) supplemented with epoxy resin prepared from diphenylolpropane or alkylresorcinols containing equivalent numbers (2.8%) of epoxide groups. Trials with various tires and experimental measurements demonstrated that a system consisting of modifier RU + alkylresorcinols yielded

superior products attributable to improved rheological characteristics of the rubber-epoxy resin mixture. The latter characteristics favored greater influx of the adhesive into the rubber-cord latticework and had no telling effect on the chemical bonding between the phases. Figures 3; references 18: 14 Russian, 4 Western.  
[89-12172/12379]

UDC 678.62-4.058

CHARACTERISTICS AND USES OF BLOWING AGENT PARA, PARA'-OXYBIS-  
(BENZENESULFONYLHYDRAZIDE)

Moscow KAUCHUK I REZINA in Russian No 9, 1985 pp 15-17

BOLSHAKOVA, S.S., GURVICH, Ya.A., MISHINA, I.M. and STOLYAROVA, L.B.

[Abstract] A brief review is provided of the characteristics and uses of the blowing agent para,para'-oxybis(benzenesulfonylhydrazide), which undergoes decomposition at 130-160°C. Tabular data are presented on the effects of various catalysts and ingredients on this hydrazide, and the net effects that such various combinations have on vulcanization and the final properties of the foams. Comparison of the results obtained with conventional blowing agents in use in the USSR has demonstrated that the hydrazide in question appears very promising as a blowing agent. It has been recommended that para,para'-oxybis(benzenesulfonylhydrazide) be subjected to further industrial testing. Figures 2; references 3 (Russian).  
[89-12172/12379]

## WATER TREATMENT

### WATER MANAGEMENT METHOD DESCRIBED

Moscow IZOBRETATEL I RATSIONALIZATOR in Russian No 8, Aug 85 pp 12-13

[Article by A. Gaydin, candidate of geological and mineralogical sciences:  
"While He Was Rolling the Stone"]

[Text] Usually ecologically safe technologies cost more than ecologically harmful ones. Here is a description of a method for the removal of waste water that is both clean and economically justified.

Saline underground water starts to run into an open pit mine that has reached a certain depth. In order to continue working, the water must be removed. But where? It cannot be dumped into a river because it would kill the fish. Then there is the "Sisyphean solution": pump the water back into the ground. Naturally, the water will seep into the pit again, and we will have to pump it out again. Is this senseless labor? Not at all. While the water is making its closed circuit, the pit will be dry. You will say "Sisyphean labor"? If you think about it, the task of Sisyphus was not altogether useless: while he was rolling the stone up the hill, the road was clear.

Professor G. V. Korotkevich came up with the "reverse pumping" method for waste water back in 1955 (Patent No 110 065). But at that time, as in recent years, his idea was not treated seriously. Why make more problems--building holes for draining the water when the water from the pit could be dumped into a nearby river or gully? There were no strict bans against this at that time. Prior to the adoption of the basic water laws it was not profitable for enterprises to pump waste water back into the earth. The experience of the Donets Basin can serve as an example to explain the result of this. Fresh underground water sources were exhausted. Drainage installations at the numerous mines dried these sources up. Many small streams disappeared, and the surviving ones were polluted by industrial wastes. There are now parts of the Donets Basin where the drinking water is supplied from the Dnepr several hundred kilometers away.

People will object and say that the Donets Basin is a drought zone. But a similar picture can be drawn in wet Lvov Oblast. For example, the construction of an open-pit mine at the Yazov sulfur deposit made dramatic changes in the underground water conditions. Fresh water followed a layer of limestone into the mine, and naturally there was a drop in the water level at water-bearing strata, and the wells in the villages dried up. At the Yazov deposit the

water-bearing limestone works in conjunction with a thick layer of gypsum. The water dissolves it, and caves are formed so that the layer of clay covering the gypsum settles and collapses, threatening the structures. The gypsum dissolved in water saturates it with salts, and the water is already unfit for drinking, and is harmful to organisms living in rivers. It can be dumped into reservoirs only after it has been diluted many-fold with fresh water. But this is not all. Bacteria live in the water-bearing stratum underground, and the gypsum dissolved in the water serves as a source of oxygen for them. The bacteria combine the sulfur and hydrogen and "breathe out" hydrogen sulfide into the water, which is very toxic. Before the water reaches the mine, so much hydrogen sulfide accumulates in it that before it can be dumped into a river it must be purified properly...Thus, drying up the Yazov sulfur deposit mine in the usual way leads to exhaustion of fresh water reserves, to collapse of the land surface, and to pollution of rivers with salts and the atmosphere with hydrogen sulfide.

If we resort to the method proposed by Professor Korotkevich, a chain of holes are drilled at a certain distance from the mine and water from the mine is pumped into them, and we protect the river from pollution. It is within our power to see that the water from these holes does not reach the stream, but returns to the mine. In the sector between the holes and the mine water will circulate in a closed system while the work is being done in the mine. If bactericide is introduced into the circulation system, the underground hydrogen sulfide "factory" will shut down. It will not be necessary to dilute water that is saturated with salts, the level of fresh underground water will rise, and the water reserves will be restored. Gypsum and limestone will not be washed away, and surrounding villages no longer face the threat of karst sinks.

At the Lvov All-Union Sulfur Scientific Research and Planning Institute an estimate was made of the effect of using the reverse pumping system at the Yazov deposits. At present 100,000 cubic meters of water enter the mine every day. The transfer of water from the mine to the purification plant costs 4 kopecks per cubic meter, and it costs another 12 kopecks to remove the hydrogen sulfide. Another 4 kopecks must be spent to transfer this cubic meter of water 20 kilometers to the holding pond. Each day 20,000 rubles are spent, and the annual expense is 7.3 million rubles. Using an electrical model of the hydrogeological conditions in the region, we made an estimate of the method for drying out the mine using the reverse pumping method. We believe that this will increase the flow of water into the mine by a factor of 1.5, that is, up to 150,000 cubic meters. This water will be pumped back into the bed through holes placed around the mine at a distance of 3-4 km. It costs approximately 5 kopecks per cubic meter to move the water. There is no need to purify the water. That means that we would spend 7500 rubles per day instead of 20,000 rubles. The annual savings would be 4.5 million rubles. We could not set up a model for or calculate the damage suffered by nature and people.

Systems similar to those proposed by Professor Korotkevich have long been used in the extraction of metals by leaching. There solutions are drained from some holes and pumped into others. There is already some industrial experience in developing deposits using the reverse pumping system, for example, at the Belozersk deposit. At the Stebnik potassium mine this method was used especially to halt the development of a salt karst. They managed to stabilize

it for the amount of time needed to erect permanent protective structures. But there are still few examples of this nature. Apparently, far from all specialists know about this economical and ecologically useful method of draining open-pit and underground mines. For it to be introduced as quickly as possible the Ministry of Geology needs to develop methodological directives that will make it possible in the surveying of deposits to evaluate in each specific case whether it is expedient to dry out the mine using the reverse pumping system. The State Committee for Construction Affairs should establish and confirm norms for planning drying systems of this nature. Then this project could move forward, especially if the State Committee for Supervision of Safe Working Practices in Industry and for Mine Supervision would not approve drainage plans that did not contain a reverse pumping system. In order for this method to become known to all specialists, the Ministry of Higher and Secondary Specialized Education should include information on reverse pumping in the curricula of mining and geology VUZes and in their textbooks.

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## PURIFICATION TREATMENT FOR UNDERGROUND WATER

Moscow IZOBRETATEL I RATSIONALIZATOR in Russian No 8, Aug 85 p 20

[Article by V. Fonbershteyn, chief of patent department at the All-Union Water and Sewage Planning Institute: "A Method for Protecting Against Rusty Water"]

[Text] Moscow scientists propose that above-ground treatment stations for removing iron from water no longer be used.

In order for underground water to be clean and to taste good, iron can be removed from it right underground, in the water-bearing stratum, before it is brought to the surface. G. M. Kommunar, V. S. Alekseyev, and V. T. Grebennikov, candidates of technical sciences and associates of the Moscow All-Union Hydrogeology Scientific Research Institute, developed the practical application of this beneficial technology, which makes it possible to do away with purification installations.

In general, iron dissolved in water is not poisonous and does not pose a threat to human health, but it is unpleasant to drink water containing iron, and one cannot wash clothes in water containing iron because it leaves yellow stains on the clothes, it makes dishes turn dark, and sinks, wash basins, and bathtubs take on a dirty appearance.

Special stations for removing iron and other chemical impurities from artesian water are quite complicated and costly. Ten years ago the following method was devised: wells are drilled and through them water enriched with oxygen is pumped into the water-bearing layer. The iron and oxygen form compounds that precipitate and form a sediment. But because it is difficult to control and monitor underground processes, this method was not put into use on a widespread basis.

With the new technology (Patent No. 985 214, 1 018 918) water saturated with oxygen is sent through an ejector and then pumped into a well. It passes through rocks that serve as a natural filter, and the filter is "loaded" with oxygen. The filter now becomes a barrier for mineral impurities contained in the artesian water. The amount of time needed to pump the oxidized water into the well is calculated beforehand, knowing the capacity of the water-bearing stratum, the porosity of the rocks, the expenditure of pumped oxidized water, and the radius of the zone of the filtering rocks.

While the water is pumped out of the well, its properties are monitored periodically. If the concentration of iron exceeds the allowable norm--0.3 mg per liter--the extraction is halted, and oxidized water is once again pumped into the well. It is convenient and economical to combine several wells into one system, where each well will pump and accept water according to its own schedule. For example, nine wells simultaneously pump out artesian water, while one pumps oxidized water into the water-bearing layer.

This new technology is now being used at artesian wells at the Kurmaneyev watershed in the Bashkir ASSR and at the "Gauya" watershed near Riga. The results are very encouraging. The water extracted contains iron within the prescribed limits, and prior to the treatment of the water-bearing stratum with oxygen the water was not suitable for drinking and other household uses. The new technology has another valuable feature--it is waste-free. The products of the purification process, iron hydroxides, settle underground and do not pollute the area surrounding the artesian wells, which is inevitable when purification installations are built. Installations for underground removal of iron from water can be built on wells of any design. The costs for reconstruction are not high, while one purification station (depending on its productivity) costs between 140,000 and 300,000 rubles.

This new technology can also be used to remove manganese, heavy metals, and hydrogen sulfide from underground water.

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## NATIVE PLANTS USEFUL FOR PURIFYING WATER

Moscow IZOBRETATEL I RATSIONALIZATOR in Russian No 10, 1985, pp 20-21

[Article by Special Correspondent M. Karlov, Astrakhan-Moscow: "Reed Antidote"]

[Text] A major pulp-cardboard combine in Astrakhan has no purifying facilities. Associates of the Astrakhan Branch of the All-Union Scientific-Research Institute of the Pulp and Paper Industry worked out a simple, inexpensive, and effective method of purifying wastewaters, which received an FRG patent (DE 30 11276 S2). But so far we have found no practical application for the invention of the Astrakhan scientists....

Twenty-two years ago the Astrakhan Pulp-Cardboard Combine was triumphantly put into operation. Because of the inadequate forethought of the designers, this major production facility has no purifying structures....

In accordance with the design, the combine puts the wastewaters into evaporator ponds where, according to the assumptions, the effluence should undergo self-cleaning and then evaporate. But more than 20 years of practice have proved the complete lack of validity of such expectations. Wastewaters do not clean themselves and do not evaporate, because the surface of the ponds is covered with an oil film.

The paper industry is one of the leading industries for water consumption and the release of wastewaters. In one year the Astrakhan Combine pours 14.5 million cubic meters into the ponds. In 22 years of work, a canal of contaminated water more than 60 kilometers has formed. And every year it grows, which does not have a very good effect on the condition of nearby towns, villages, and fresh lakes. The Tinaki Mud-Bath Health Resort is practically ruined....

In order to save the situation somehow, L. A. Karzhavina, Yu. B. Ovchinnikov, Ye. G. Gordeyeva, and I. S. Dzerzhinskaya from the Astrakhan Branch of the All-Union Scientific-Research Institute of the Pulp and Paper Industry proposed a new method of biological purification of wastewaters. Many such methods are known, but here, for sulfate-pulp production, not one had been suitable--either it took too long, was too expensive, or was not every effective.

...They started in the laboratory, with aquariums. They tested more than 50 species of plants--not one would absorb sulfates dissolved in water. Even an acknowledged "sanitation engineer" such as aqueous hyacinth immediately perished and disintegrated completely within 5 days....

A simple idea came into someone's head--to use the plants which were most common in the oblast--bulrushes, lesser reedmace, and common reed--and pass the wastewaters of sulfate-pulp production through them in that order. Researchers could not believe their eyes: under laboratory conditions the purification took 9 days, and in the field--a week. The plants coped with the effluents better than cleverly designed equipment. Here is an example of this: the delta of the Volga abounds in bulrushes, reedmace, and reeds, and the water there is clean. The plants drink up the harmful substances and accumulate them intensively--the water is cleansed of poisons. Microbes are also annihilated--in the undergrowth of the reeds there are practically no *E. coli*, salmonella, and other pathogenic microbes.

Economically the method is very advantageous. Water can be used repeatedly. Costs to clean it are substantially reduced. The plants are planted one time and they do the growing. In addition, they themselves can be put into the production of pulp--the dried mass of reeds can be processed.

It is true that after this purification part of the water remains "colored" with microalgae. Where to put it? Why, on the fields. Many agricultural crops grow extremely well in such water. Even in the winter there is no problem--the growing season of plants in Astrakhan Oblast continues from March to December. And bulrushes, in general, are actively living year-round.

Biological ponds have been constructed in Astrakhan and Kzyl-Orda (where there are analogous production facilities) for natural tests. Depending on the period of growth of the plants, the effectiveness of purification amounted to 67-95 percent! Muskrats live in the Astrakhan biological ponds and the banks are always full of young--*Daphnia* are caught for household aquariums for feeding fish. And *Daphnia* do not live in polluted water.

In October 1984, a project was undertaken by the technical administration of the USSR Ministry of Timber, Pulp and Paper, and Wood Processing Industry. With this the job was under way. In order to resolve the problem it was necessary to construct three ponds with a total area of 60-70 hectares. But the Rostov Medical Institute (which treats the southern region of the country) had to form conclusions on the sanitary-bacteriological suitability of using the purified effluents--was it dangerous for humans to put it on fields? The institute agreed to give a toxicological assessment of produce grown in the purified wastewaters of the combine in 2 years. If it turns out to be impossible to put the purified effluents on the fields, it can be released into the Volga--the degree of purification is adequate for that.

The approximate cost of the project is 60,000 rubles (30,000 per year). Chief engineers of the combine and the Astrakhanpromzagotkamysh Association, V. I. Ratnikov and G. N. Romanenko, and V. A. Rodin, director of the Astrakhan Branch of the All-Union Scientific-Research Institute of the Pulp and Paper Industry, turned to G. F. Pronin, deputy minister of the USSR Ministry of

Timber, Pulp and Paper, and Wood Processing Industry, with a request to allocate these funds. On 3 April 1985 they received a reply signed by V. D. Solomonov, chief of the technical administration of the ministry: "The technical administration is not able to allocate the funds.... This question can be examined for the 1986 plan." And what if it is not examined?

Currently the combine is unhurriedly constructing purification facilities which will collect only fibers and gross mechanical impurities. Only 4 million cubic meters of water are scheduled to be returned to the water supply. The remaining 10.5 million will proceed along the usual path. Funds have been allocated for this solution to the problem, which is not the most rational.

...I did not get to the experimental biological lakes--the mud in the way is such that you cannot approach either in a Gazik or in rubber boots. So only the canal with the contaminated water, covered with the oil film, remained in memory....

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## CONTROLLING WATER CHLORINATION PROCESS

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 8, 1985 pp 6-8

MARCHENKO, YU.G. and GONTAR, YU.V., candidates in technical sciences and MGEN, V.A., engineer, Ukrainian Community Project, Kharkov

[Abstract] In order to compensate for the wide variations in agricultural and industrial waste water chlorine-absorbing capability, a method for controlling the process of water chlorination was developed. The method was tested over a period of two years on water of widely varying quality, with a chlorine absorbing capacity which varied from 0.8 to 4.1 mg/l over 30 minutes. Concentration of residual chlorine varied linearly with chlorinator contact time after 2-5 minutes. Concentration of residual chlorine after 30 minutes of contact was highly correlated with that after 2 minutes. In order to increase the stability and quality of process control, the required chlorine is added in two portions, with control of residual chlorine concentration between additions. This is accomplished by splitting the flow into two streams, in one of which the residual chlorine content is corrected automatically. Process validation was conducted using a target residual chlorine concentration of 1.5 mg/l and a contact time of 30 minutes. Microbiological quality of the processed water was always at least equal to that from conventional processing; in most cases coliform bacteria viability was less with the new system. The proposed system increases the accuracy of residual chlorine content control at the exit from the contact apparatus, lowering chlorine waste and avoiding disruption in sanitary quality. Figures 4; references 3 (Russian).  
[22-12126/12379]

UDC 628.16.067

## PURIFICATION OF PETROLEUM PLANT WASTE WATER

Moscow VODOSNABSHENIYE I SANITARNAYA TEKHNIKA in Russian No 8, 1985 pp 22-23

KARELIN, YA.A., doctor of technical science, and YEVSEYEVA, L.A. and YEVSEYEVA, O.YA., candidates in technical sciences, (Moscow Construction Engineering Institute imeni V.V. Kuybyshev), and GAMZALIYEV, G.M., candidate in technical sciences, Caucasian Health Resort Construction Combine

[Abstract] Due to its greater availability and lower cost than quartz sand, crushed claylite was tested as a material for use in purifying petroleum plant waste water. Grade 550/800 claylite, which met preliminary requirements for physical and chemical stability and particle size, was soaked to remove internal gases and washed to eliminate fines. Comparison of quartz sand and claylite filters indicated that the claylite was more effective in reducing

suspended matter, petroleum product content and chemical oxygen requirement. Claylite also had a greater duration of the filtration cycle. The mean production capacity of a claylite filter was  $427 \text{ m}^3/\text{m}^2$ , while that for a quartz sand filter was only  $148 \text{ m}^3/\text{m}^2$ . The claylite filter also lost its pressure head more slowly. Filtration efficiency was found to be inversely proportional to rate of filtration and to be greater for particles of 1.5 mm mean diameter than 1.0 mm or 2.6 mm. Filters charged with 1.0 mm particles lost much more of their pressure head after filtration, while 2.6 mm particle filters lost somewhat less than 1.5 mm particle filters. The data indicate that filters containing particles of 1.5 mm mean diameter and a filtration rate of 10 m/hour are most suitable. Contaminated particles can be regenerated with live steam. Figures 2; references 1 (Russian). [22-12126/12379]

#### HYGIENIC EVALUATION OF LOW-WATER RIVER BASIN

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 8, 1985 p 24

SNYTIN, I.A., candidate in medical sciences, Alma-Ata Complex Department, Kazakh Scientific Research Institute of Water Conservation

[Abstract] The Tobol River basin has low water flow due to the numerous reservoirs and dams which have been constructed along it. Water conservation measures involving liquidation of all effluent discharge into that Tobol basin have improved the microbiological quality and decreased mineralization. The need is stressed to consider hygienic factors in planning and constructing agricultural, residential and industrial developments for the basin. [22-12126/12379]

UDC 628.112.3

#### CHANGING BACTERIAL INDICATORS IN WATER

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 8, 1985 pp 28-29

YERUSALIMSKAYA, L.F., candidate in medical sciences, and BURCHAK, T.V., candidate in medical sciences, Kiev Scientific Research Institute of General and Communal Hygiene imeni A.N. Marzeyev

[Abstract] The artificial replenishment of underground water tables was studied using a device consisting of two infiltration basins and a network of canals leaking into them. The basins had a 30 cm sand layer over a 40 cm gravel layer at the bottom and reinforced concrete slabs at the sides. During use of the infiltration basins, a dome of subterranean water, up to 17 m high and 1550 m wide, formed under the basins. About 55 million  $\text{m}^2$  of surface water was introduced into the water table during each of two summer-fall seasons of use. The microbiological quality of the subterranean water, which was often

below drinking-water levels before the experiment, was improved by the artificial replenishment. Analysis of the muddy layer formed on the basin after use, as well as the sand underneath, showed a sharp decrease in bacterial contamination with depth. This demonstrates that the sand serves as an active biofilter. Figures 2; references 6 (Russian).  
[22-12126/12379]

UDC 628.162.82

#### WATER OZONATION AT MOSCOW EAST WATER WORKS

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 8, 1985 p 30

SMIRNOV, V.A., candidate in technical science, Moscow East Water Works

[Abstract] Apparatus for producing ozone electrically from air and using the ozone-air mixture produced for water ozonation is described. Direct connection of the electrical motor and the compressor, replacement of oxidizing aluminum components with plastic and ceramic with metalloceramic, replacement of nickel steel clamps with stainless steel and addition of a system for the catalytic decomposition of excess ozone improved the functioning of the ozonator. Dielectric spark-over at high humidity or maximum load remained a problem. Use of the ozonator decreased the cost of water purification reagents by 22% and reduced the amount of sediment. Figures 1.  
[22-12126/12379]

UDC 620.197.3

#### SELECTION OF CORROSION-INHIBITORY PHOSPHATE DOSES FOR STEEL PIPES

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 9, 1985 pp 11-12

NAYMANOV, A.Ya., candidate of technical sciences, and BALINCHENKO, O.I., engineer, Makeyevka Engineering and Construction Institute

[Abstract] A mathematical analysis was conducted on the selection of doses of sodium hexametaphosphate and sodium tripolyphosphate for the inhibition of corrosion of water-bearing steel pipes. The factorial analysis was conducted in terms of the concentration of  $\text{SO}_4^{2-}$  (50-250 mg/liter),  $\text{HCO}_3^-$  (50-350 mg/liter), and  $\text{Ca}^{2+}$  (10-90 mg/liter) ions, as well as a temperature range of 2 to 25°C. Model studies were conducted with distilled water adjusted for the above factors by addition of salts and variation of temperature, while on-site studies were conducted with water from the Northern Donets river. Based on such analysis, the corrosive effects of Northern Donets water can be reduced to below the critical level by the addition of  $\text{PO}_4^{3-}$  to a concentration of 3.5 mg/liter. Figures 2; references 3 (Russian).  
[131-12172/12379]

## CONTROL OF IRON BACTERIA IN COMMUNAL WATER SYSTEMS

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 9, 1985 pp 13-15

RUSANOVA, N.A., candidate of medical sciences, RYABCHENKO, V.A. and KOROBEYNIKOVA, L.I., candidates of biological sciences, and GOYRAINOVA, G.S., engineer, KVOV [expansion unknown] Scientific Research Institute

[Abstract] A minireview is presented of the various approaches that may be taken in the control of iron bacteria in communal water supplies, particularly since these bacteria account for approximately 80% of the cases of spoiled drinking water. A list of the effective means includes monitoring subterranean waters for iron bacteria concentrations, as well as more active means of water treatment. The latter utilizes a variety of technologies, including sand filtration, chlorination, nonmetallic water conduits, and special linings for metallic pipes. The effectiveness of the various treatment modalities have to be planned and implemented with consideration to the prevalent chemical composition of the water and ambient temperatures. References 8: 7 Russian, 1 Western.

[131-12172/12379]

UDC 628.16.081.3

## ADSORPTION TREATMENT OF INDUSTRIAL WASTE WATERS

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 9, 1985 pp 20-21

KHODOROV, Ye.I., candidate of technical sciences, SEMERIKOVA, V.V. and TARABUTKIN, Ye.V., engineers, All-Union Scientific Research Institute of Glass Fiber, Kalinin

[Abstract] A review is presented of adsorbent systems used for the treatment of industrial waste waters. Emphasis is placed on the need for readily available and inexpensive adsorbents, as well for efficient regeneration technology. Single and column schemes are discussed, as well as countercurrent operations. The arguments presented also demonstrate that the conventional approach to the selection of a suitable adsorbent on the basis of equilibrium data is by itself inadequate. For a full appreciation of treatment potential the adsorbent must also be evaluated in kinetic terms, both before and after regeneration following prolonged use. Figures 3; references 7: 4 Russian, 3 Western.

[131-12172/12379]



## WOOD CHEMISTRY

### IMPROVEMENT NEEDED IN PROVISIONING OF PULP AND PAPER COMBINE

Moscow LITERATURNAYA GAZETA in Russian 15 May 85 p 10

[Unattributed article: "No One Is Responsible for the Load" [Obezlichennyy vagon]]

[Text] Balakhna Pulp and Paper Combine is standing idle because of interruptions in the provisioning of raw materials and the impossibility of shipping its output out in time, according to the correspondence of M. Podgorodnikov, "Obezlichennyy vagon" (LG, 14 March 1985).

In connection with its appearance in LITERATURNAYA GAZETA, Secretary of Balakhna Gorkom A. Lyalyuyev reports:

"The difficulties in the work of Balakhna Pulp and Paper Combine and measures to eliminate them have been discussed more than once in the gorkom.

"The combine has taken additional measures to assist railroad workers in organizing the repair of the covered cars bringing the load of paper: the repair service on the Donbass machine has been filled out with workers, and piece-plus-bonus pay for their labor has been adopted. As a result of this, 235 cars were repaired in March alone.

"Under the conditions of underdeliveries of wood (since the beginning of the year, 35,000 cubic meters less than planned have been delivered), work has been going on at a reduced mass-volume output of paper compared with what the plan calls for. Because of this, there was a savings of raw materials in 1985 equal to 6,000 cubic meters of wood.

"The question of financing projects for reconstruction and expansion of the Pravdinsk railroad station has been resolved."

A reply was also sent by D. Didkovskiy, deputy minister of the USSR Ministry of Timber, Pulp and Paper and Wood Processing Industry. He reports that the ministry entrusted some departmental institutes with presenting for confirmation by 1 July 1985 a design for a goal-oriented integrated program detailing measures to stabilize the supplying of Balakhna Pulp and Paper Combine with raw materials for the period up to the year 2000. Plans call for perfecting the technology in the pulp and paper combine in order to increase the use of soft-leaved wood and technological wood scraps. A number of timber procurement and sawmill enterprises of Kostroma and Kirov oblasts will be specialized



to produce a specific output for the combine. Farms with plantations for growing spruce wood are also being organized. They will be subordinate to the Balakhna Pulp and Paper Combine.

A schedule of deliveries of raw material before the end of 1985 has been confirmed. The Ministry of Communications has established an increased target for delivering loads to Balakhna Pulp and Paper Combine.

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ABOVE-PLAN OBLIGATIONS UNDERTAKEN BY PULP AND PAPER COMBINE

Moscow LESNAYA PROMYSHLENNOST in Russian 5 Sep 85 p 1

[Unattributed article: "Step of a Leader"]

[Text] The collective of Kotlas Pulp and Paper Combine imeni 50-Letiye VLKSM has undertaken socialist obligations to accelerate scientific-technical progress and raise the effectiveness of production in the 12th Five-Year Period.

Laborers, engineering-technical workers, and employees of Kotlas Pulp and Paper Combine, striving for a worthy greeting of the 27th CPSU Congress, will fulfill in a timely fashion, by 7 November 1985, the targets of the 11th Five-Year Plan.

There will be an additional 97,000 tons of cellulose for boiling produced above the established plan, as well as 794 million square meters of paper, 342 million square meters of cardboard, 1.8 million square meters of fiberboard, 423 tons of nutrient yeasts, and 4.2 million rubles' worth of consumer goods. Goods worth 95 million rubles above the plan for selling output established for the 11th Five-Year Plan will be produced, and labor productivity will rise by an additional 7 percent.

Fulfilling the CPSU Central Committee decree "On the Experience of Work of Collectives of Kotlas and Solikamsk Pulp and Paper Combines in Economical and Rational Use of Raw Wood, Fuel-Energy and Other Material Resources," the combine saved 360,000 cubic meters of wood, 106 million kilowatt-hours of electricity, 470,000 gigacalories of heat, 58,000 tons of standard fuel, and 36,000 tons of chemicals, which made it possible to reduce the prime cost of producing goods by 2.6 percent and material outlays by 6 percent.

Striving for a worthy greeting of the 27th CPSU Congress, the collective is undertaking to produce in 2 months of 1986 commercial goods worth 500,000 rubles in addition to the plan. Unanimously supporting the course undertaken by the party to accelerate scientific-technical progress and switch the economy to the intensive path of development, and following the initiative of leading enterprises of the country to achieve the highest results of work in the 12th Five-Year Plan, the collective of Kotlas Pulp and Paper Combine is undertaking the following obligations.

Based on modernizing equipment, replacing obsolete forms with more productive ones, installing automatic and semiautomatic production lines, and automated systems of control, to fulfill an integrated program of reconstruction and technical reoutfitting of the cardboard-paper and viscose production facilities, paper bag shops, nutrient yeast shops, Thermal Electric Power Station No 1, and the railroad.

By doing this, to increase the production capacities for manufacturing cardboard by 283 million square meters, viscose cellulose by 10,000 tons, paper bags by 60 million bags, and nutrient yeasts by 8,200 tons, as well as expanding the projected capacity for boiling cellulose by 28,000 tons and bringing its manufacture up to a million tons per year. To increase the output of cardboard by 8.6 percent by the end of the 5-year period, the output of paper bags by 21 percent, and the output of nutrient yeasts by a factor of 2.2.

To produce 40,000 tons of commercial-grade cellulose in addition to the target for the 12th Five-Year Plan, and an additional 18,000 tons of paper (including 3,000 tons of print-grade paper), and 1 million square meters of fiberboard. To ensure comprehensive growth of volumes of production by reducing the work force based on well-planned certification and rationalization of work places, mechanizing manual labor and labor-intensive processes, and technical reoutfitting. To reduce the number of workers by 320 individuals, or 3 percent, in existing production facilities.

By further adopting resource-saving technologies, perfecting and intensifying intracompany cost-accounting, and reducing the mass-volume of paper and cardboard, to achieve a savings of 400,000 cubic meters of raw wood as compared with control figures of the 5-year period, reduce the specific consumption of basic chemicals by 3 percent, thermal and electrical energy by 5 percent, fuel by 4 percent, and the prime cost of production by 2.5 percent. To increase the use of secondary resources for technological purposes, and increase the output of thermal energy by 5 percent. To switch over to waste-free technologies of using raw wood. For these purposes, to introduce in a timely fashion a soda regeneration unit, for utilizing organic wastes of wood and chemicals with a productivity of 110 tons of steam per hour, an experimental production line with large unit capacity for processing technological scraps, and a bark boiler room.

To double the production of consumer goods and produce 2 million rubles' worth of them above the targets of the five-year period.

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CSO: 1841/81

## DAMAGE TO RESIN-PRODUCING TREES

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 25 Oct 85 p 2

[Article by A. Golovenko: "Smoke for a Dissertation"]

[Text] Question: How do they lovingly refer to Vasilii Petrovich Ryabov in Soyuzleskhimprom All-Union Association? And the respectful answer: "Orator No 1."

...On that distant evening, the chief engineer prepared especially thoroughly. He was to appear at a meeting of the board of the USSR Ministry of Timber, Pulp and Paper and Wood-Processing Industry and turn its members into supporters of an innovation which had, according to his estimations, epoch-making significance for the sector. And what was the discussion about? So that everyone understands, let us shed light on the very beginnings of the wood chemical industry, named for the collection of soft resin--that is, pine resin.

From mid-May to late September, workers of wood chemical enterprises wander about the back woods of the taiga, cutting open pine trees and taking the resin. In plants it is turned into turpentine and colophony, without which we would never see paper, glass, rubber, paints and varnishes, and many other absolutely essential goods. But recently, wood chemical workers have not been making their many clients from dozens of sectors very happy--they chronically disrupt the plans.

At the same time, specialists are sounding the alarm: too much wood has been cut which did not give even a drop of resin, which "stands idle," so to speak, without working. I. V. Ryabov, who has stood for many years at the helm of the technical policies in the wood chemical subsector of the USSR Ministry of Timber, Pulp and Paper, and Wood Processing Industry, has been reprimanded more than once.

"You are a candidate of science," the ministry reproached him. "And what you have in tapping sap, just as 20 years ago, is completely manual labor: knife and funnel. If you keep lagging behind scientific thought in the century of the scientific and technical revolution, you will never get out of the slump."

The reproaches played their role, and Vasilii Petrovich suddenly had a bright idea! In this iridescent glow he appeared at the meeting of the board of the Ministry of Timber, Pulp and Paper, and Wood-Processing Industry.

..."Until now, cutting the spruce by hand, we were somewhat at the mercy of nature," he pontificated.

Henceforward, to get the resin in the winter, the orator proposed using the "thermal method," which he personally had discovered. Under the action of heat, sap frozen in the trunk should melt, he assured the board, change into colophony right there, and as such fall at the feet of the collector. An unbelievable savings--to get colophony directly at the wood-cutting site, bypassing processing at the plant! Amber hills of the new raw material would stabilize the colophony balance of the country in two shakes.

The members of the board were fascinated and approved the "thermal method." Vasilii Petrovich was on top of the world: he had received approval from above! And below, not a twig or bramble could be seen to block the way. After all, he had at his command hundreds of wood chemical enterprises which had only to be asked, and would then joyfully rush to adopt the innovation of their boss. And he shouted out: "Adopt it, comrades!" Soyuzleskhimprom gave shape to the wish in the form of a plan target.

But twigs and brambles, and then even whole logs sprang up in the path of the fire method. General directors of associations put them there in the form of ticklish questions: how specifically should the trees be heated? They waited for an economical and safe device for heating. The author of the innovation went out to the wood-cutting site and explained:

"Take a flare or blowtorch, a can of gasoline, and press it against the spruce until the tree starts to cry hot tears. Then you put them in a bucket...."

The workers diligently burned the trunks in the Vologda, Ural, West and East Siberian woods, but instead of golden piles of colophony they wound up with a sort of black swill from singed trees. And as it turned out--an unthinkable prime cost. Because for every kilogram of the "product" up to a liter of gasoline or solar oil was consumed. The directors of the farms began to break into hot tears....

A super problem rose up to its full height: where to put a product that was of no use to anyone? Vasilii Petrovich had another bright idea: into the boiler with it, perhaps something would be cooked up.

"You will be pioneers of assimilating the new raw materials!" Thus he fired up the ambition of the leaders under him at Tikhvin Wood Chemical Plant, sending the barrels there. "Show what you are capable of."

The "pioneers," with an acid expression on their faces, set about lighting the boilers and soon they reported: excuse us, Vasilii Petrovich, but some kind of sludge has been produced from your raw materials which has such low qualities that no State Standard has foreseen it. Paper and glassmakers will run from it faster than deer, to say nothing of radio technicians....

Nuisances knocked at the door of the chief engineer one after another. The Buryat ASSR Council of Ministers absolutely forbid their wood chemical enterprises to roast their shipbuilding spruce. And the Eksportles All-Union Association, for its part, refused point-blank to take scorched trees.



A scandal seemed inevitable with the completely bankrupt "thermal method." His acquaintances advised its inventor to go to the minister with a confession as quickly as possible. To say, I am sorry, Mikhail Ivanovich, the devil misled me. I took wood chemistry to the wrong place. And so, I am willing to accept whatever punishment is proper.

If they had known exactly what devil had misled the chief engineer, for what reason he had undertaken large-scale arson at the wood-cutting sites, then perhaps they would have advised him to confess to the public prosecutor.

By the time the riskiness of his innovation became clear, Ryabov had written the final pages of his doctoral dissertation. Despite the fact that the farms under him had gone bankrupt, he cheerfully scribbled away about profits. He depicted the new direction as "the first in the USSR and world practice" and had already started all wood chemical enterprises of the ministry in that direction.

When the manuscript had been tied up in a string and approved with laudatory praises by the author himself, he presented it for defense to Leningrad Wood Technical Academy. But the academicians were not impressed at all either by the publicity discussions of the candidate concerning the world priority of his undertaking, or by the promised stabilization of the colophony balance. Vasilii Petrovich floundered under the hail of questions from the scientists concerning the economics of his innovation like a C-student at the final exam. But here he could not manage to scramble out--he drowned. In short, the doctoral was not a burning success.

They found out about the failure in the ministry, but the sorrowful resin extractor so elegantly presented his failure that they kept on wishing him further successes in igniting the sludge of the dissertation. The winter season of 1984-1985 passed under its sign. Some 250 tons were burned by the entire ministry, losing, according to estimates of specialists, about 1 million rubles....

Now not only practical workers but also major figures in forestry science were seized by a sort of shock. The blindness of the leaders at the headquarters of the sector staggered the Riga Institute of Wood Chemistry, the Siberian Technological Institute, the Urals Wood Technical Institute, the Belorussian Ministry of Timber Industry, and the Main Administration for Provisioning and Marketing Pulp and Paper Products under the USSR Gossnab....

At first we thought that the headquarters of the sector had gotten lost in the woods, and we tried to lead it out of its forest of delusions. On 8 March, in a small notice in SOTSIALISTICHESKAYA INDUSTRIYA, one specialist from the system of the Ministry of Timber, Pulp and Paper, and Wood Processing Industry estimated that burning the spruce in Ust-Ilimsk Wood Chemical Farm alone would lead to irreplaceable losses. It was said that rather than spending time on harmful innovations, it wouldn't be a bad idea for wood chemical workers to put an end to poor management and confusion at the wood-cutting sites. It was because of this that they were losing 60,000 to 70,000 tons of excellent resin per year. This was much more than necessary to fill in all the deficiencies in the plans. From Ust-Ilimsk, the reply came: Thank you for the support, we are going bankrupt at the whim of our patron.

But it turned out that we had simply underestimated the oratorical powers of Comrade Kyabov. In a reply for publication, Deputy Minister N. Savchenko informed the editorial office: We will keep on burning the taiga, for the scorched liquid. Of course, it is all clear to the deputy minister. But it wouldn't be any sin for him to listen to the opinion of scientists. Here is a curious question, however: From whose pocket did the ministry pay for the thermal games of its subordinate, and where is it going to get the money in future? Have they perhaps established a special bankruptcy fund there? Then what are its sources?

12255

CSO: 1841/81

## BUREAUCRATIC OBSTACLES TO INTRODUCTION OF NEW PRODUCT FOR FLOORING

Moscow LESNAYA PROMYSHLENNOST in Russian 17 Oct 85 p 2

[Article by I. Lemberik: "Parquet Adrift: Who Is to Blame for Slow Introduction of a Valuable New Product?"]

[Text] Perhaps the term "new product" is inappropriate here. Lignamon was a new product a decade and a half or two ago. It was back at that time that the Institute of Wood Chemistry of the Latvian SSR Academy of Sciences, which was headed by Academician I. Ya. Kalninsh, developed an industrial procedure for obtaining this material.

In 1972, in March, a LESNAYA PROMYSHLENNOST reporter wrote: "When you enter the license pavilion of the State Committee for Inventions and Discoveries, which is in Moscow on Krasnaya Presna, you cannot help noticing the parquet floor. It looks like oak, but it is made from aspen. This is lignamon, a low grade wood improved with ammonia solution."

A year later the newspaper carried a detailed report stating that the development of Latvian scientists was being used in our country, though of course not within the former USSR Ministry of Forestry, the technical administration of which was already contemplating its impermanence. However, engineers of Wood Processing Combine No 13, located in Lyubertsy, near Moscow, were working actively. The main construction materials administration did not have enough hardwood for parquet production, and in order to make up for the scarcity, back in 1971 the enterprise created an experimental industrial section for plasticization of deciduous softwood.

In March 1974 the newspaper reported that the Institute of Wood Chemistry of the Latvian SSR created a unique multioperation unit for integrated plasticization, compaction and drying of wood in 1973 jointly with the same kind of institute in Czechoslovakia. Soviet and Czechoslovak scientists were awarded author's certificates. An analysis showed that the procedure proposed by the two cooperating institutes was much more effective than those that had been developed in the USA, Austria and other states.

In September of the year before last the newspaper once again returned to the topic of wood improvement, publishing an article titled "And an Alder Became a Beech." The official response could be interpreted in but one way: We've never made it, we aren't making it and we will not make it.

In justification of his position, A. Buyanov, deputy chief of the technical administration of the USSR Ministry of Timber, Pulp and Paper and Wood Processing Industry, stated his objections in relation to lignamon, its production procedure and the developers of the problem themselves. But frankly speaking, reproaches addressed toward the institute cannot be said to be valid.

The institute was reproached for ignoring economics. This is not justified either. The institute conducted deep research with the purpose of predicting the demand for lignamon. According to estimates it would be 130,000 cubic meters in the next few years in our country. Use of this quantity of the new material would save about 144,000 cubic meters of hardwood. Not less than a million rubles would be saved just in parquet production alone.

Associates of the academy's Institute of Wood Chemistry are not ignoring economic details. There is no way you can call their calculations concerned with the benefits of using lignamon "tentative," as they were called in Buyanov's response.

One of the most avid supporters of this material, Candidate of Technical Sciences G. Berzinsh (incidentally, he had transferred from the institute to the Gauya Scientific-Production Association in order to promote introduction of the new product more actively), calculated the economic effectiveness with accuracy down to a ruble. Thus 183,000 rubles could be saved by producing 900,000 square meters of parquet annually; the benefit from manufacturing 50,000 bent-wood chairs would be 88,300 rubles. Twenty-eight thousand rubles could be saved by producing parts for 3,000 Sekor hedge trimmers.

Lignamon has a relative--destam, which is obtained by processing wood with urea. Destam is compacted into rounded shapes to make slide bearings in the form of bushings. This procedure was assimilated by the Pavlovsk Forestry Enterprise in Voronezh Oblast. The shop has been operating for almost a quarter of a century, and each year it produces about 400,000 bushings for agricultural machine building enterprises.

Back in 1930 the Bryansk Machine Building Plant began producing wood modified thermomechanically. It was then used to manufacture machine parts. This work is now well organized at the Kosterevo Industrial Plastics Combine imeni Komintern in Vladimir Oblast, and at the Gomel Plastic Articles Plant.

This week I telephoned the oblast main administration of construction materials and construction parts to ask what was new in production practices. I received an invitation:

"Visit us and see how well the lignamon line is operating in Stupino. It makes fabulous decorator parquet. Thanks to scientists from the Riga Institute of Wood Chemistry, who help us so much!"

The editor rarely receives invitations of this sort from enterprises of the Ministry of Timber, Pulp and Paper and Wood Processing Industry. It is a shame, is it not, that lignamon is being used more and more



"unofficially," and that specialists who by nature of their duty and calling are obligated to support all innovations in wood processing, prefer to play the role of official opponents: "It's useless, it won't work, it's nothing but naive theorization...." It is much easier to pin labels on things than to take the time to deal with a new product.

Inattention or neglect can retard progress in a given direction of science and technology, but it can never be stopped. So it was with lignamon as well. After surmounting the departmental barriers, it will make its way into furniture industry also. I was shown a chair at the Gauya laboratory. It was made from modified alder, and I could not tell it apart from oak: It was just as substantial and solid, and it had the same noble grain. I was told the facts:

"It costs 195 rubles to produce a cubic meter of improved alder wood, while a cubic meter of oak wood costs 276 rubles. Moreover oak wood is extremely hard to find."

Engineer Gunars Berzinsh listed the instances where lignamon could be used, but first it must be manufactured. We need up to a hundred production units, but today there are no more than ten. Thorny is the path of an unwanted child!

Executives responsible for technical policy must have a keen sense of the new. But alas, they did not display these qualities of the mind and heart in relation to production of lignamon.

Unfortunately this is not an isolated story. Ten years ago I wrote in an article titled "Debate over Parquet" about how workers of the technical administration neglected a radiochemical method for improving deciduous softwood proposed by the Physical Chemical Institute imeni L. Ya. Karpov. A similar method is now used extremely widely abroad. Thus more than 70 companies are now operating in the USA. One of them has built a unit that produces about 11,000 tons of products per year.

We have every right to be proud in the fact that the first artificial diamonds in the world were obtained in our country. Also deserving kind words are those who are altering the most profound properties of wood, making it more noble and useful to man. It has been estimated that in our times, each ruble invested into sciences produces a tenfold return. But this dependence has not yet established itself in the matter of lignamon.

The Institute of Wood Chemistry is least of all to blame for this. It is the executives of the technical administration that must answer for all of this. They rejected outright a valuable idea materialized not only in a volume of annual scientific reports and numerous dissertations, but also in the steel of autoclaves and hectares of wear-resistant parquet, and they caused long delays in introduction of a valuable means of fundamental improvement of the properties of wood. And so they are now looking for any real mistakes the Latvian scientists may have made--is there any new effort in which mistakes are not made!--and coming up more with imagined mistakes.



Departmental ambitions win out, while the interests of the national economy lose out.

It was emphasized at the June conference of the CPSU Central Committee on the problems of accelerating scientific-technical progress that it is the duty of the executive to display creative initiative and a capability for thinking and generating ideas, and to fight for their implementation.

To generate ideas! In our case the technical administration had an easier task: The idea had already been born and developed in detail by academy science. What was needed was a feeling for the new, and interest. These qualities are precisely what were not displayed by executives upon whom the fate of lignamon depended then and depends now. It is no longer enough to be an official opponent. One must become an ally of the pioneers.

11004

CSO: 1841/105

## PAPERMAKERS RAISE PRODUCTION IN BALAKHNA

Moscow LESNAYA PROMYSHLENNOST in Russian 26 Oct 85 p 7

[Article by L. Dyachenko, chief engineer, Balakhna Order of the October Revolution Pulp-and-Paper Combine imeni F. E. Dzerzhinskiy: "Robot in the Shop"]

[Text] This will be a noteworthy year in the history of Soviet pulp-and-paper industry. The sector's first paper packing robot will go into operation in Balakhna. I am sure that it need not be explained to the reader that the modern robot is not necessarily similar in shape to its creator--man. Our "hero" does not walk around the shop, picking up rolls of finished product. Instead, the rolls are fed to an automatic roll packing line (such is the robot's full name) by means of mechanisms. It is after this that the subsequent production operations are performed by the robot. All of them, beginning with measuring and marking and ending with transporting the packed rolls to the warehouse, are controlled by a computer. The line's productivity may make even the most experienced packer envious. It processes two rolls in just a minute. The robot will service papermaking machines No 5, 6 and 7. We, the workers of the combine, have already had a possibility to persuade ourselves as to the merits of this form of technology. The final adjustments are now coming to their conclusion, and this month the robot will take its place next to papermakers of Shop No 2.

Besides the obvious advantages, which need not be discussed, the packing line's automatic system will provide us a possibility for obtaining shift, daily and monthly data on paper production at any time, and we will be able to eliminate laborious bookkeeping.

Balakhna papermakers "made friends" with automation long ago. Many complex, laborious jobs were assumed by the latter. Automation has gained an especially strong position in the pulp production operation. During the time of its fundamental reconstruction, when five old riveted boilers were replaced by bimetallic boilers and another with a volume of 320 cubic meters was installed, the level of production automation increased significantly: The decanting unit was adapted for dispatcher control, and an automated system for controlling cooking in all Avtosulfit boilers was introduced.

All of this made it possible to raise pulp production to 138,000 tons per year, despite the fact that according to the plan, this level was to be

much lower--103,000 tons. Today the pulp cooking process proceeds smoothly at the combine, the mechanical indicators of the pulp have improved, and the yield from a cubic meter of boiler space has increased.

Automation has come to the assistance of not only the pulp- and papermakers (let me add parenthetically that in the same paper Shop No 2, an automated system based on a Soviet computer complex was introduced for online control of a newspaper production process, with excellent results); today it also serves the economists of Balakhna, helping them to answer questions concerned with current and future planning.

In and of itself, as we know, automation solves few problems, and it can work properly only under the tutelage of competent, talented specialists. There are many such people in our combine. We have a strong engineering corps. If one were to take a look at all of our shops and production operations, he would find perhaps not a single corner in which a Balakhna engineer has not applied his hands and his wisdom. I would say that a "Balakhna" approach to solving technical and production problems has appeared in the sector. What does it entail? Mainly, concentration of the attention of engineers on solving the most current problems. There is, however, a certain "second-guessing" done in this approach. We do not wait until a problem engulfs us completely. We prepare for its appearance beforehand, we predict it, and we meet it ready for battle.

Take as an example the raw material problem. It is growing more complex from one year to the next. We are receiving more and more nonstandard wood. In order to use it better, a new chopping machine with a wood chip sorter was installed at the timber exchange. This Soviet machine unit has not yet enjoyed wide use, but it already has its own history. One of the first models was installed at the Solikamsk Pulp and Paper Combine. It did not work out at first. On learning of this, we became concerned: After all, we were to receive a similar machine. A Balakhna specialist went to Solikamsk and acquainted himself with the machine's work on the spot. Then installation of a similar machine unit was started in our place. Without going into the details, let me say that it was installed successfully, and now we have no complaints about the machine unit's work. Many other examples could be presented revealing how equipment with soiled reputation acquired reliability in the hands of our specialists.

Specifically speaking, the example of the "chopper" provides only a small part of the total picture of how we are solving the raw material problem. There is another example, which I have brought up many times before, that is more indicative. In the not-too-distant future we will install equipment at the combine to produce chemical-thermomechanical pulp. At the moment only Syktyvkar has a similar one. What is so good about this pulp? The new intermediate product allows us to reduce consumption of pulp in paper production, to make wider use of deciduous wood, and to create conditions for further reduction of the weight of a sheet of newsprint. Last week a contract was signed for delivery of two complete production lines to Balakhna with a total productivity of 200,000 tons of pulp per year. Without a doubt introduction of this equipment will insure us a dependable future, and help us get into the world market.

I would like to emphasize that I have not even mentioned a tenth of all of the new things that have been introduced during this five-year plan. Their description would require too much room--after all, their number now exceeds 400.

The fight to introduce the accomplishments of scientific-technical progress has had a positive effect on the rhythmicity of production, and on the work of the combine. In 4 years of the 11th Five-Year Plan Balakhna workers surpassed the paper production plan by 77,800 tons. In comparison with 1980, last year about 400 million square meters of additional paper were produced. Moreover this increase was attained with a smaller number of workers: During this time 499 persons were released by the existing operations for other work.

As we can see, the collective of Balakhna papermakers began the last year of the 11th Five-Year Plan with a good headstart. But in the very first quarter we were let down awfully by our associates. The loggers undersupplied the combine by 111,000 cubic meters of raw timber. And the railroaders simultaneously fell short by over 700 rail cars to carry finished products away. For just these two reasons alone we lost 200 million square meters of newsprint. The raw timber supply situation continues to be tense. The plans for wood deliveries by both rail and river rafting are not being met.

But it was not without purpose that we spent so much effort to improve production and to introduce the accomplishments of scientific-technical progress. That which was done in the past, and the organizational and technical measures implemented this year, helped the collective, beginning as early as in March, not only to surpass the state plan but also to reduce the shortfall of newsprint. Introduction of a new method for carrying timber on flatcars equipped with fasteners, and of a new procedure for packing wood for ship transport, allowed us to receive a large quantity of raw material within a short time, to get it into production quickly, and to simultaneously send finished products out without delay. In the future we intend to build a new unloading unit in the timber exchange outfitted with two portal cranes and a slab saw. Goods will be loaded at two locations at the finished products warehouse, meaning that we will be able to process 30 rail cars simultaneously.

The reader would validly ask: Where is this "bottomless" pocket from which we are getting all of this money? I will tell you where. According to existing standards on production reconstruction, we can spend not more than 799 rubles per ton of production increase. But we are spending half this amount. This savings is an additional source of financing.

But Balakhna workers have also learned to economize in the production process itself. Recently we completed assimilation of a new production process for manufacturing newsprint with a weight of 45 grams per square meter. In 1983 we produced only 50,000 tons of this fine product, while last year we produced as much as 109,300 tons. In just the first half of this year we produced 104,700 tons of 45-gram paper. We are now preparing to convert to production of even finer paper--40-43 gram paper. This would of course require introduction of new accomplishments of scientific-technical progress.

The country's labor collectives are now adopting socialist pledges for the 12th Five-Year Plan. Many have supported the initiative of the motor vehicle plant workers. We also evaluated our reserves, and decided to surpass the paper production quota by 10,000 tons in the next five-year plan. Robots, computers and automation will help us keep our promise.

11004

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## EFFECT OF WOOD SPECIES AND ITS MOISTURE CONTENT ON POLYMERIZATION OF METHYL METHACRYLATE

Riga KHIMIYA DREVESINY in Russian No 5, Sep-Oct 85 (manuscript received 24 May 84) pp 51-54

SUTYAGINA, S.Ye., GLUKHOV, V.I. and ZOLDNERS, Yu.A., Branch of Scientific Physical Chemical Research Institute imeni L.Ya. Karpov, Institute of Wood Chemistry, LaSSR Academy of Sciences

[Abstract] The effect of the species of wood and its initial moisture content on the rate of radiation-induced polymerization of methyl methacrylate (MMA) was studied using linden, birch, white beech, pine and spruce samples. The polymerization rate was higher in hard wood than in the soft woods. An increase in moisture content (25--30%) lowered the dose necessary for complete conversion of the monomer. High levels of moisture lowered the polymerization rate. High initial moisture content improved grafting efficiency and lowered the molecular weight by extracted homopolymers. Polymerization rate of MMA was also lowered by milling the wood into saw-dust. Figures 6; references 9 (Russian).

[136-7813/12379]

## PROPERTIES OF MODIFIED LIGNOSULFONATES USED AS FIBERBOARD BINDERS

Riga KHIMIYA DREVESINY in Russian No 5, Sep-Oct 85 (manuscript received 21 Jun 84) pp 61-65

ELBERT, A.A., DOROKHOVA, O.V., KHOTILOVICH, P.A., KRYUKOVA, L.I. and CHIRKOVA, V.S., Leningrad Forest Technology Academy imeni S.M. Kirov

[Abstract] Lignosulfonates (LS) are byproducts of sulfite-cellulose production with many desirable properties. Among other applications, they are used as binders for fiberboards. A number of chemical modifications was studied aimed at improving their properties. When mono- and divalent cations in LS polymolecule are replaced by a higher valence cation, particles of LS complex become enlarged and the LS structure becomes more complex. Thermal treatment of LS containing an aluminum ion leads to the formation of water insoluble compounds, the quantity of which increases with prolongation of the treatment and with the temperature rise. Binding properties of LS are affected by pH of the medium and by aluminum content. It was shown that aluminum-LS could be used as a binder for fiber-boards. Figures 5; references 16: 13 Russian (2 by Western authors), 3 Western.

[136-7813/12379]

## BIOCHEMICAL OXIDABILITY OF ACID AND LEVOGLUCOSE TARRY FRACTION COMPONENTS FROM LIGNOCELLULOSE THERMOLYSIS CONDENSATE

Riga KHIMIYA DREVESINY in Russian No 5, Sep-Oct 85 (manuscript received 11 Jun 84) pp 87-92

AUNINYSH, E.A. and ZENKOV, A.K., Institute of Wood Chemistry, LaSSR Academy of Sciences

[Abstract] Chemical composition of acid and levoglucose tarry fractions of the lignocellulose thermolysis and the rate of biochemical oxidation of individual components was studied. The amount of dissolved oxygen required for biochemical oxidation increases with the increase of hydrocarbon number of monocarboxylic acids along with the adaptation period of microbes. The slow-down of biochemical oxidation is caused by the admixtures of tar in technical levoglucose and in the thermolysis paste. Lignohydrocarbon associates form with high boiling phenol the so called soluble tar; they are partially broken down by enzymes and are utilized by active sediment microorganisms. Together with local adsorption purification, this simplifies biochemical purification of effluent of lignocellulose thermolysis. In light of the slow degradability of monocarboxylic  $C_4$ -- $C_7$  acids and tar components, a recommendation was made to perform biochemical purification of such effluents by extended aeration method and by local adsorption assuring removal of methoxy phenols and their oligomers. Figures 5; references 9: 7 Russian, 2 Western.  
[136-7813/12379]

## DYNAMICS OF FRACTIONAL AND AMINOACID COMPOSITION OF LARIX SIBIRICA NEEDLES IN RELATIONSHIP TO THEIR AGE

Riga KHIMIYA DREVESINY in Russian No 5, Sep-Oct 85 (manuscript received Jun 84) pp 93-95

KARGAPOLTSEV, A.P., REPYAKH, S.M. and YUSHIPITSINA, G.G., Siberian Technologic Institute

[Abstract] Protein content in the needles of *Larix sibirica* changes with its age from 22.9% based on dry weight in May to 9.6% in August. Fractional composition of protein complex also varies considerably. Water soluble and base soluble proteins predominate among the soluble material: 26--32% of total proteins are water soluble and 46--63% are alkali soluble. Also, the aminoacid composition of water soluble protein changes with the age of needles: lysine (6-13% of total aminoacids), proline (5-11%) and valine (4.2-10%). Water soluble proteins contained 54% of essential aminoacids; they exhibited high nutritional value and could be used in fodder. References 8 (Russian).  
[136-7813/12379]

## MISCELLANEOUS

### THREE CHEMICAL DISCOVERIES OFFICIALLY RECOGNIZED

Moscow IZVESTIYA in Russian 1 Nov 85 p 2

[Article by I. Novodvorskiy: "The Many Faces of Chemistry"]

[Text] On 31 October 1985 the USSR State Committee for Inventions and Discoveries registered three discoveries by Soviet scientists associated with different areas of chemistry.

A discovery made at the Institute of Physical Chemistry of the USSR Academy of Sciences and the Institute of Electrochemistry by doctors of chemical sciences V. Gromov and V. Krylov is associated with solid dissolution processes. Dissolution has always attracted researchers because it is one of the most widespread processes in nature and in industrial production.

Dissolution is controlled by changing temperature and the intensity of mixing, by pulverizing the substance to be dissolved, and recently by ultrasound and high frequency magnetic fields.

The authors of the discovery were able to show that when solid dielectrics are dissolved, the rate of dissolution would change noticeably if these substances are polarized beforehand or during the time of their dissolution--that is, if they are converted to a state in which their electric charges are oriented by means of a constant electric field.

Besides providing theoretical knowledge, this discovery can be used to create production processes involving dissolution of mixtures of substances, when the rate of dissolution of individual ingredients of the mixture must be selectively controlled in order to permit isolation of the ingredients needed most (valuable minerals, for example).

Associates of the Institute of Chemical Physics of the USSR Academy of Sciences--Doctor of Physicomathematical Sciences Ye. Frankevich and Candidate of Physicomathematical Sciences Ye. Balabanov--also studied the mechanisms and methods of stimulating chemical reactions, but in another area.

They discovered the phenomenon of an external magnetic field's influence on photoprocesses--that is, on reactions proceeding with the participation of light. Experiments conducted by the authors showed that properties of solids such as photoconductivity, some indicators of luminescence and the rate

of photochemical transformations change in response to a weak magnetic field. New methods and instruments for research in chemistry and physics were developed on the basis of the discovery. The discovery promoted development of a new area of science--so-called "spin chemistry," the ideas of which have enjoyed international recognition.

Hydrocarbons of the petroleum series contained in sedimentary rock may be removed completely from the latter by solvents. At least this is what was thought prior to the work of geochemists from Tashkent--Uzbek SSR Academy of Sciences Academician A. Akramkhodzhayev, Candidate of Geological-Mineralogical Sciences Sh. Amirkhanov and Doctor of Geological-Mineralogical Sciences A. Kirshin, associates of the Institute of Geology and Prospecting of Petroleum and Gas Fields of the Uzbek SSR Ministry of Geology.

They were able to reveal that petroleum and gas hydrocarbons are present in micropores in the insoluble fraction of organic matter in sedimentary rock. These hydrocarbons are the products of biochemical and thermal transformation of this insoluble fraction.

Their discovery will make it possible to create more-accurate methods of estimating potential reserves of oil and gas in individual regions, and to develop new scientific principles for seeking accumulations of these minerals.

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